THE

AIR FORCE IN SPACE

FISCAL YEAR 1961

by

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USAF Historical Division Liaison Office

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FOREWORD

This is another in a series of historical studies on the role and activities of the Air Force in space, prepared by the USAF Historical Division Liaison Office. Earlier studies include An Air Force History of Space Activities 1945-1959, by Dr. H.L. Bowen, from which was drawn a smaller study, The Threshold of Space 1945-1959, covering the evolution of national space policies and programs with emphasis on the Air Force role. The Air Force in Space 1959-1960, by Max Rosenberg continues this coverage, for fiscal year 1960, within the context of the national space program and USAF strategic objectives. (A special study, USAF Space Programs, 1945-1962, contains an annotated chronological listing of important milestones, decisions, and other events of the many USAF space undertakings by project.)

The current study carries the story forward through fiscal year 1961. It describes the impact of Soviet space achievements on the U.S. national space program, discusses the assignment to the Air Force of important new space development responsibilities, and reviews the various projects pursued by the Air Force to acquire military space capabilities.

Almost all of the planning and research for this study was the work of Mr. Rosenberg, who was formerly chief of the Technological History Section of this office. The arduous task of working with and writing from the research notes fell to Carl Berger, the author of the study.

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I. THE AIR FORCE AND THE NATIONAL SPACE PROGRAM

(S) During 1960-1961, in response to new and dramatic Soviet military and space achievements, the United States accelerated or reoriented its space program on three separate occasions. In August 1960, following the destruction of an American U-2 reconnaissance aircraft over central Russia on 1 May, President Dwight D. Eisenhower ordered a speed-up of the Samos reconnaissance satellite development in order to maintain some type of surveillance over the Soviet Union. In March 1961 the new President, John F. Kennedy, requested additional funds from Congress to accelerate development of the Midas early warning satellite system and other USAF space projects.* Finally, in May 1961—acting under the further prod of the spectacular orbiting on 12 April of Soviet Maj. Yuri Gagarin, who became the first man in history to travel through space—President Kennedy went before a joint session of Congress to ask for still more funds to support "a great new American enterprise," the landing of an astronaut on the moon and his safe return to earth before the end of the decade. All of these major decisions and program changes affected the Air Force directly and indirectly.

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* The individual Air Force projects will be discussed in succeeding chapters.

Soviet Space Achievements and the 1960 Election

(U) It was not surprising that Soviet space achievements became an issue in the 1960 presidential election campaign. Although the United States had chalked up a remarkable record in space technology in the three years following the launch of Sputnik I on 4 October 1957,* the Soviets had still maintained a clear-cut lead in rocket power and dramatic "firsts." In his campaign for the presidency, then-Senator Kennedy ticked off Russian achievements to support his contention that the nation was losing the race for space and that the Republicans were to blame: "The first man-made satellite to orbit the earth was named Sputnik. The first living creature in space was Laika. The first rocket to the moon carried a Red flag. The first photograph of the far side of the moon was made with a Soviet camera. If a man orbits the earth this year his name will be Ivan..." [1]

(U) The senator emphasized the necessity of accelerating the nation's space program because[2]

> If the Soviets control space they can control the earth, as in past centuries the nation that controlled the seas dominated the continents. This does not mean that the United States desires more rights in space than any other nation. But we cannot run second in this vital race. To insure peace and freedom, we must be first.

(U) Kennedy's Republican opponent, Vice President Richard M. Nixon, also agreed that "our military forces must have the mission and the necessary strength to defend 'freedom of space.'" Nixon denied that the

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*By 4 October 1960 the United States had launched 26 earth satellites and two space probes compared to six satellites and two space probes launched successfully by the Soviet Union.

U.S. was losing the space race, however, and--echoing Eisenhower's view that "the United States leads the world in activities in the space field that promise real benefits to mankind"--he insisted that "we are ahead of the USSR." [3]

(U) Within weeks after his narrow 1960 election victory, President-elect Kennedy appointed Dr. Jerome B. Wiesner of the Massachusetts Institute of Technology to head a special nine-man ad hoc committee to review the nation's space program. He directed the Wiesner committee to identify personnel, technical, and administrative problems which would require the prompt attention of the new administration. One of the key members of this committee was Trevor Gardner, president of Hycon Manufacturing Company,* who together with Dr. Wiesner and others was also undertaking a separate study for the Air Force of current and planned U.S. space systems (see below).

(U) After studying a number of major areas of the U.S. space program, the Wiesner committee on 10 January 1961 reported to the President-elect and voiced serious criticism of the existing organization and management of the U.S. space effort. Specifically, the committee declared that neither the National Aeronautics and Space Administration (NASA) nor the "fractionated military space program" nor the long dormant National Aeronautics and Space Council had been adequate "to meet the challenge that the Soviet

*Other members of this ad hoc committee, besides Dr. Wiesner and Mr. Gardner, were: Kenneth E. Belieu, staff director, Senate Committee on Aeronautical and Space Sciences; Donald F. Hornig, chairman, department of chemistry, Princeton University; Edwin H. Land, president, Polaroid Corp.; Max Lehrer, assistant staff director, Senate Committee on Aeronautical and Space Sciences; Edward M. Purcell, professor of physics, Harvard University; Bruno B. Rossi, professor of physics, Massachusetts Institute of Technology; and Harry J. Watters, assistant to the President, Polaroid Corp.

thrust into space has posed to our military security and to our position of leadership in the world."[4]

(U) Referring to the Department of Defense (DOD), the committee noted that:[5]

> Each of the military services has begun to create its own independent space program. This presents the problem of overlapping programs and duplication of the work of NASA. If the responsibility of all military space developments were to be assigned to one agency or military service within the Department of Defense, the Secretary of Defense would then be able to maintain control of the scope and direction of the program and the Space Council would have the responsibility for settling conflicts of interest between NASA and the Department of Defense.

(C) In a classified section of the Wiesner report, the committee said there were "important and unique uses of space for national security..." The most urgent of these were "surveillance and target reconnaissance over the land masses of the world with particular emphasis on the Sino-Soviet bloc." The committee implied that major military missions in space should be assigned to the Air Force. It pointed out that the Air Force already provided 90 percent or more of the resources and support required by space projects assigned to other military agencies and was the nation's "principal resource for the development and operation of future space systems, except those of a purely scientific nature assigned by law to NASA."[6]

(C) To improve management of the nation's space program, the committee made five recommendations to the President-elect. They included establishment of a single agency within DOD to manage the military portion of the space program. The committee also urged additional emphasis on booster

development, manned space flight, "the military uses of space," and the application of space technology to the civilian activities of the nation.[7]

USAF Is Assigned New Space Responsibilities

(U) Soon after the Kennedy administration took office, and while the President and his Secretary of Defense Robert S. McNamara, were considering the recommendations of the Wiesner committee, the House Committee on Science and Astronautics issued a report charging that "certain pressure groups within the Air Force" had joined with "segments of industry" in an attempt to undercut the U.S. civilian space agency.* This situation, the committee charged, was creating "an unhealthy competitive atmosphere" and leading to "costly and unnecessary duplication." The chairman of the committee, Representative Overton Brooks, discussed this "purported" duplication in a letter on 14 February 1961 to Dr. T. Keith Glennan, the retired head of NASA, who in turn contacted Gen. Thomas D. White, USAF Chief of Staff. In his reply to Dr. Glennan, General White said he was directing key Air Force officials to get together with the new NASA leadership "to determine how we may, with finality, lay the ghost of this alleged NASA-Air Force dissension and duplication..."[8]

(U) The issue was not immediately resolved, however, and General White during an appearance before the Brooks committee in March publicly denied that the Air Force had any plan or intention "to take over NASA." Despite this disclaimer, Brooks asked the President to clarify the administration's position on the roles of NASA and DOD. He referred to a "suggestion

*For additional background information, see Chapter III, pp 30, 31.

implicit" in the confidential section of the Wiesner report that NASA's role was "purely one of scientific research and that the military role in the development of space systems will be predominant." The President assured Brooks that it was not and had never been his intention "to subordinate" NASA space activities to those of DOD. However, the President also expressed his belief that there were "legitimate missions in space for which the military services should assume responsibility." [9]

(U) Concerning these missions, soon after taking office Secretary McNamara ordered his staff to re-examine DOD's role in light of the Wiesner committee's criticism of the "fractionated military space program." This study was completed in late February 1961 and led to a draft directive aimed at centralizing space system development in DOD. The draft was circulated to the secretaries of the military departments, the chairman of the Joint Chiefs of Staff (JCS), and other officials with a request for comments. On 6 March 1961, after giving "careful consideration" to comments received, Secretary McNamara announced that he had decided "to assign space development programs and projects to the Department of the Air Force, except under unusual circumstances." [10]

(U) The Defense Secretary emphasized his decision would not "predetermine the assignment of operational responsibilities for space systems." Such assignments would be made on a project-by-project basis, taking into account "the competence and experience of each of the services and the unified and specified commands." Each service under the new directive was authorized to conduct "preliminary research" on new ways of using space

technology to perform assigned missions. All such research, however, required approval of the Director of Defense Research and Engineering (DDR&E).[11]

(U) Despite the assurances that their space interests would be protected, the Army and Navy were unhappy with the Secretary's decision. In their comments on the draft directive, they had expressed concern over giving major space responsibilities to the Air Force on grounds that it would result in an overall loss of effectiveness through failure to utilize their services' background experience, initiative, and brain power. Stories of Army and Navy displeasure reached the press, including a report to the effect that the chairman of the JCS, Gen. Lyman Lemnitzer, had strongly opposed issuance of the directive. On 12 March, in response to the above, Representative Brooks announced that he would hold special hearings into the ramifications of the new directive and would call top Pentagon officials before his committee.[12]

(U) The first witness, Deputy Secretary of Defense Roswell Gilpatric, on 17 March strongly defended the directive and decision to centralize space development programs under the Air Force. He explained that while the Wiesner report had been one of the factors which produced the directive, there had been others. "We found," he said, "that the different services had programs and projects of their own which unless brought into a centralized organization for supervision and control could lead to overlapping and duplication, and misuse of resources."[13]

(U) Gilpatric assured the committee that the directive was not intended to impair the capabilities of any of the services or to infringe upon their

proper roles and missions. He denied charges that the directive would make two services "subservient" to a third. In this connection, General White--appearing before the committee on 18 March--also assured the committee that the Air Force would "bend over backward to meet the requirements of the Army and Navy as prescribed by the directive." [14]

(U) After hearing from Army and Navy officials and General Lemnitzer who denied he opposed the directive, the committee concluded, among other things, that it was not in a position to pass judgment as to the correctness of McNamara's decision. It noted that the directive was but one step in a long chain of decisions to meet new conditions in the defense establishment, and that it reflected recognition of a situation in which the bulk of funds for military astronautics already was being spent by the Air Force. The committee recognized there remained strong differences between the services as to their roles with regard to military space systems. It said that the purpose of the directive seemed to be to avoid the possible creation of three comprehensive competing and duplicating space programs. [15]

(U) The committee recommended, however, that a "continuing close scrutiny" be given activities of DOD related to research and development and astronautics to insure that the Air Force remained fully responsive to the needs of the other services. The committee asked Secretary McNamara and the three service secretaries to keep it informed "on the success of the directive in actual operation" and on any future related directives. [16]

(U) Meanwhile, acting under terms of the 6 March decision, the Office of the Secretary of Defense (OSD) on 28 March issued a new directive governing development of DOD reconnaissance, mapping, and geodetic satellite systems. The Air Force was made responsible for research, development, and operation of all DOD reconnaissance satellites and for all instrumentation and equipment used in processing data obtained from those satellite systems. It also was directed to provide, launch, and recover mapping and geodetic satellite payloads, and to deliver the collected raw data to the Army. The latter received major responsibility for establishing and managing an overall DOD geodetic and mapping program.[17]

Reorganization for Missile and Space Programs

(U) The 6 March 1961 directive assigning space development responsibilities to the Air Force triggered a major USAF reorganization. For some time Air Force officials had been examining possible functional realignments within the Air Research and Development Command (ARDC) and Air Materiel Command (AMC). Now, in order to centralize direction of the ballistic missile program and "to insure the most effective discharge of those military space responsibilities assigned to the Air Force," the Air Force on 17 March, after an intensive review of past reorganization studies and recommendations, announced sweeping command changes. The Air Force Systems Command (AFSC) was created and assigned responsibility for all activities concerned with the development and acquisition of aerospace and missile systems. In addition, basic research elements were placed under the new Office of Aerospace Research

(OAR) reporting directly to the Chief of Staff, USAF.[18] The reorganization was to be completed by 1 July 1961.

(U) In establishing AFSC, the Air Staff approved creation of four major subordinate elements: the Space Systems Division, composed of elements of ARDC's Ballistic Missile Division and AMC's Ballistic Missiles Center; the Ballistic Systems Division, also composed of elements of ARDC's Ballistic Missile Division, AMC's Ballistic Missiles Center, and the Ballistic Missile Construction Office of the Army Corps of Engineers; the Aeronautical Systems Division, combining the Wright Air Development Division of ARDC and the Aeronautical Systems Center of AMC; and the Electronic Systems Division, which combined ARDC's Command and Control Development Division and the Electronic Systems Center of AMC.

(U) As described by General White before a Senate subcommittee, the Air Force reorganization was designed to provide more rapid decisions and accelerated actions on ballistic missile and other designated system programs and to insure efficient, responsible management of the recently assigned space development mission. White said it also would facilitate the integration and close participation of the Army Corps of Engineers in the ballistic missile site activation task and would provide for effective liaison and active participation by the Army, Navy, and NASA in projects being developed for those agencies by the Air Force.[19]

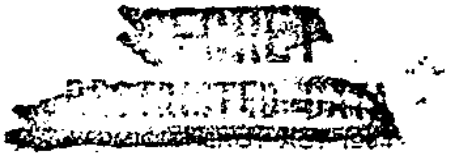
The Gardner Committee Report

(U) As noted earlier, Trevor Gardner, a former Assistant Secretary of the Air Force who served on the Wilson committee, during this period

chaired a USAF study committee reviewing the nation's space programs. This committee was created by Gen. Bernard A. Schriever, ARDC/AFSC commander, in October 1960. Among the well-known scientists and industrialists who served on the committee were Dr. Wiesner, Arthur R. Kantrowitz, Dr. Harold Brown (soon to become DDR&E), William O. Baker, William C. Foster, Stanislaw M. Ulam, Mark Kac, Charles C. Lauritsen, Conrad L. Longmire, W. Randolph Lovelace II, Frank T. McClure, Charles H. Townes, and John W. Tukey.

(S-RD) In asking Gardner on 11 October to head the committee, General Schriever added that he hoped the group might emulate the von Neumann or Teapot Committee which Gardner had organized seven years earlier and which had been so instrumental in starting the unprecedented USAF ballistic missile program in 1954. Schriever believed that a comprehensive and dynamic Air Force space development program should be considered as "a matter of urgency" since military operational capabilities in space would materially strengthen the nation and perhaps insure its survival. He asked Gardner to evaluate current and planned space systems, review ARDC's management policies, procedures, and resources, and recommend an optimum development program extending as far as practical into the future. He requested a report by 15 January 1961.[20]

(S-RD) The Gardner committee held its first session between 27-29 October, at the Pentagon, and quickly found that it would require the services of specialists who could supply technical and managerial information on which to base a meaningful report. Gardner thereupon established the Los Alamos Study Group composed of 17 outstanding scientists and



technicians (none of them from the parent committee), and the Air Force Space Study Management Group of 12 industrial and military experts (four of them from the committee). The former took up full-time residence at the Los Alamos Scientific Laboratory and devoted a period of nine weeks to technical studies.[21]

(S-RD) Between October and March 1961 the committee met five times and submitted its findings and recommendations to General Schriever on 20 March, several months behind schedule. The committee's basic findings were disturbing. It reported that if the United States continued its current program unchanged, it would be unable to duplicate the spectacular Soviet space achievements for at least three to five years. Soviet emphasis on advancing fundamental space techniques and capabilities carried grave military implications that would endanger future American security and international prestige. The committee criticized the American (administration) insistence on separate and distinctive "military" and "peaceful" space programs, which had unduly complicated matters both at the national and international levels and pointed to the step-child status accorded the military program as especially deleterious. "National security considerations alone justify a major increase in the Department of Defense space effort," the committee declared.[22]

(S-RD) The committee did not attempt to list military requirements in detail and in fact was unsympathetic to many current USAF proposals. It emphasized instead the basic need to first advance essential techniques and capabilities (large boosters, rendezvous, docking, co-orbiting, etc.). It

made little sense for the Air Force, the committee said, to state finite space requirements and to spell out operational systems to meet them. Rather the bulk of the space effort should be devoted to constructing a firm technological foundation with both NASA and DOD concentrating on fundamentals or building blocks. Such an approach would not contradict national policy since capabilities or mastered techniques were not of themselves inherently military or peaceful in nature.[23]

(S-RD) The committee also emphasized its concern over the lack of participation by the services in the scientific exploration of space. In years past, the services had provided competent leadership and had engaged extensively in such activity without charges of militarism. The Lewis and Clark Expedition,* the exploration of the polar regions, and the International Geophysical Year were cited as a few examples; the committee, therefore, could see no reason for placing space "off limits." In conclusion, the committee recommended major military participation in an over-all broadened U.S. moon program--a step-by-step, time-oriented project to land men on the lunar surface and return them to earth sometime between 1967-1970 (far in advance of any currently contemplated schedule). It saw such a project resulting in development of broad technological capabilities whose "fallout" would be tremendous and applicable to both civilian and military purposes.[24]

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*The Lewis and Clark Expedition was the first scientific venture financed by the Federal government, at a cost of $2,500. Both Lewis and Clark were Army officers.

(U) As events transpired, the Gardner committee report became one of the points of departure in formulating the national objective of a lunar expedition.

II. MAN ON THE MOON - A NATIONAL OBJECTIVE

(U) On 5 July 1960, months before the Gardner committee was created, the influential House Committee on Science and Astronautics in a report on the nation's missile and space programs recommended that a "high priority program should be undertaken to place a manned expedition on the moon this decade." In January 1961 the Wiesner committee suggested that the ultimate goal of NASA's Project Mercury should be establishment of a manned space station and "the eventual manned exploration of the moon and the planets." On 11-12 February, in a special report to the President, the Space Science Board of the National Academy of Sciences also recommended that "scientific exploration of the moon and planets should be clearly stated as the ultimate objective of the U.S. space program for the foreseeable future." On the other hand, outgoing President Eisenhower--in his last budget message to Congress on 16 January--was cautious. Referring to the Mercury system which was being tested to assure a safe manned orbital flight in 1961, he said additional test and experimentation would be needed to determine "if there are any valid scientific reasons for extending manned space flight beyond the Mercury program."[1]

(U) President Kennedy also did not immediately "buy" the proposed manned moon project. Instead, as one of his first orders of business after taking over the presidency, he chose to accelerate existing military and

civilian space programs. Thus, on 28 March 1961 in a special message to Congress on the defense program, he asked for an additional $144 million to speed development of Midas, Dyna-Soar, Discoverer, and several other space-oriented military projects. In addition, in a separate message dealing with the NASA program,he asked for new funds to accelerate development of larger boosters and other space projects.[2]

(U) The committee hearings on President Kennedy's revisions of the last Eisenhower budget had scarcely begun when the Soviet Union intervened once again to decisively energize the entire American program. On 12 April 1961 the Soviet Union announced that Major Gagarin had successfully orbited the earth in a 108-minute flight in a five-ton Vostok spacecraft, becoming the first man in history to fly through space. The impact of this event, while perhaps not as great as the launch of Sputnik I on 4 October 1957 (since the manned flight was anticipated), nevertheless generated much frustration, excitement,and gloom in the United States. One Congressman, Representative James G. Fulton of Pennsylvania, voiced a common complaint when he declared that he was "darn well tired of coming in second" in space. At a news conference President Kennedy agreed, saying that "no one is more tired than I am" of being behind the Russians. "The news will be worse before it is better, and it will be some time before we catch up."[3]

(U) Commenting on the Russian success, during an appearance before a House subcommittee, General White, USAF Chief of Staff, declared that if there had ever been any doubt that the Soviet threat was increasing, it had been erased by the Gagarin flight. "This great achievement," he said, "is

an indication for all the world to see of the excellence of Soviet space technology, their knowledge of biomedicine, the reliability and power of their means of propulsion, and the precision of their guidance systems... In my opinion, failure on the part of this nation to recognize the warning, the challenge...could prove disastrous." [4]

An Air Force-Proposed National Space Program

(U) On 13 April, the day following the Gagarin flight, Secretary McNamara met with Secretary of the Air Force Eugene M. Zuckert and the Director of Defense Research and Engineering, Dr. Herbert F. York, and asked each to study independently the recently-published Gardner committee report and to re-examine the national space program from the viewpoint of DOD requirements. They were asked to present their findings and recommendations by 28 April. This assignment became Project 107 in McNamara's initial sweeping review of the Department of Defense. After 20 April it also served a second purpose providing part of a response by Vice President Lyndon B. Johnson to the President on "where we stand" in space.[5]

(C) A hectic two-week period followed as key USAF agencies undertook to compile their report. Initial meetings were held at the Pentagon and at AFSC headquarters at Andrews AFB on 15-16 April. The following day a special task force organized at the Space Systems Division under Maj. Gen. Joseph R. Holzapple, AFSC Assistant Deputy Commander for Aerospace Systems, began drafting the report. It subsequently underwent AFSC review on 25 April, and similar scrutiny by the Air Staff, the Air Force Council, and the Office of the Secretary of the Air Force (OSAF) on 25-26 April.[6]

(S) On 1 May 1961 Secretary Zuckert forwarded the Holzapple report to McNamara and re-stated the Air Force's concern over "the apparent inadequacy of our current National Space Program." He observed that unless the program was substantially broadened and upgraded at an early date, fundamental capabilities could not be made available in time to support known and anticipated space system requirements. Zuckert also noted that the USAF report being submitted was based on the Gardner and other Air Force studies but did "not necessarily relate to assignment of component missions." [7]

(S) The Air Force, the report declared, was convinced that the current national space program would not permit the nation to compete on equal terms with the Soviet Union. Yet it also was clear that the Russians could not be permitted to win the technological race "which potentially could shatter the Free World's security, alliances, and prestige." Should the Soviet space effort produce a real military superiority over the United States, it was likely the Russians "would brandish their new military power to intimidate and dominate the entire globe." Arguing for a broadened program, the Air Force said the nation's economic, scientific, and technological base was more than adequate to support an accelerated space effort; the only current limitation was lack "of firm decision and clear cut direction." [8]

(S) The Air Force listed the various military goals and objectives in space and described development efforts already under way. Most of these efforts needed to be either broadened or accelerated, with more

attention being given to basic and applied research and advanced technology. It identified the large booster program as the most immediate problem and the primary cause for the U.S. lag behind the Russians.

(S) The heart of the Air Force proposal came in a plea for a dramatic national objective since "the space lag existing between the USSR and the United States is due in large part to failure to establish a sharply focused national space goal and clear-cut assignment of responsibility for its achievement." It said that the exploitation of large boosters, recovery, re-entry, and rendezvous techniques, and manned space flights might suffice for military requirements in the next few years, but it would not allow for the sought-for supremacy in space exploration. The latter depended on some feat worthy not only of the nation's technological potential but of capturing the world's imagination. A clear decision to mount a manned expedition to the moon sometime between 1967-1970 would have tremendous international and national significance, while providing as a byproduct better ways to accomplish the national defense mission.[9]

(S) The Air Force said that long-time studies showed convincingly that an orderly and phased lunar expedition culminating in a 1967 landing and return was perfectly feasible. It would, however, require high priorities, appointment of a single manager, closely integrated support from all interested agencies, and provision of adequate funds. The Air Force estimated expenditures would mount to an annual rate of more than $4 billion, although benefits derived were seen as far exceeding that sum.[10]

(S) In summary, the Air Force in its report to McNamara took a position similar to that of the Gardner committee: establish the lunar expedition as a national goal and use it as the framework upon which to concentrate on a broad research and development effort. The Air Force realized that it had little chance of being selected to head the expedition, but fully expected to play a major role, particularly in the superbooster area which since October 1959 had been solely a NASA responsibility.

DOD-NASA Proposed National Space Program

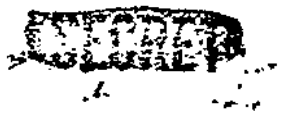
(S) Seven days after receipt of the USAF proposal, Secretary McNamara and NASA Administrator James E. Webb on 8 May forwarded to Vice President Johnson their own combined proposal for a revised and expanded space program. They reported that "this document represents our joint thinking," but it was obvious--as one Air Staff member later remarked-- that "in essence... most of the Air Force recommendations were bought and incorporated into the National Space Program." [11]

(S) McNamara and Webb noted that space projects were carried on for one of four reasons: to advance scientific knowledge; to improve the national defense; to promote commercial or civilian endeavours; or to enhance national prestige. In only the last of these was there a Soviet lead, which was directly attributable to the Russians' large launch vehicles. However, they said that possession of these vehicles bestowed other advantages "which may some day become important from a military point of view," and therefore it was essential for the United States to remove launching disparities. McNamara and Webb emphasized the need for a strong, coordinated,

and integrated national effort to define requirements and development "building blocks"—the fundamental technical capabilities. "We are not satisfied," they said, with current prospects.[12]

(S) To eliminate existing shortcomings and to enhance national prestige, positive and forceful decisions were necessary. Like it or not, civilian (peaceful) projects were part of the cold war and, although they might affect American military strength only indirectly, if at all, they would have increasing effect on the national posture. On this basis, McNamara and Webb declared that the future well-being of U.S. space and national endeavours demanded an immediate increase in appropriations and actions "to establish and to direct an 'Integrated National Space Program.'"[13]

(S) The two agency chiefs outlined a number of short and long-range goals to meet the objective. First and foremost was the lunar expedition, a gigantic and costly task which they recommended the United States should pursue even though the odds favored the Russians accomplishing the feat first. Other suggested projects to enhance prestige and the peaceful use of space included global communication and weather prediction systems and more scientific space investigations of all kinds. The last of their recommended goals--perhaps most basic and important to the rest--was an expanded and accelerated development of large boosters, both for civilian and military purposes. McNamara and Webb admitted that the military potential and implications of large boosters was unknown, but "it is known that without the capacity to place large payloads reliably into orbit, our nation will not be able to exploit whatever military potential unfolds in space."[14]



(S) To support their recommendations, McNamara and Webb suggested a second supplemental increase to the original fiscal year 1962 budget request. NASA would receive $549 million additional and DOD $77 million (to begin development of a large solid-fuel booster and a new upper stage vehicle, the latter as back-up to the floundering Centaur.*) This would raise NASA's proposed FY 1962 budget to $1,784.3 million and DOD's to $1,082.9 million, exclusive of such items as range and facility construction, supporting research and development applicable to both aeronautics and astronautics, and already-developed missiles used as boosters.[15]

(S) Johnson and the National Aeronautics and Space Council (NASC) accepted the McNamara-Webb recommendations with only minor changes, and urged their acceptance by the President. The program and budgetary increases subsequently submitted by the President to Congress approximated closely those of the McNamara-Webb report.

The Reoriented and Expanded National Space Program

(U) In considering the report submitted by the Vice President, Kennedy was encouraged by growing public support for an expanded national space program. For example, the previous autumn the Harvard Business Review had released results of a survey it had conducted of some 1,950 business and industrial leaders which showed that 73 percent of the respondents chose space research as more important than cutting taxes. These business leaders also expressed a preference for space research over more leisure and consumer goods (96 percent), shorter working hours (97 percent), power plants

*Centaur, a NASA development responsibility, was planned for use in the Advent communication satellite project. See Chapter IX.

and dams (61 percent), and foreign economic aid (59 percent).[16]

(U) Within Congress members of the aeronautical and space committees also strongly supported increased expenditures to enable the United States to overtake the Russians. For example, on 3 May 1961, the House Committee on Science and Astronautics voted budget authorizations for specific lunar-related projects far in excess of then-current administration requests.* The successful suborbital flight of Cmdr. Allan B. Shepard on 5 May also won congressional adherents. Senator Robert S. Kerr, chairman of the Senate space committee, remarked afterwards, "I think this flight has given the President and Congress the green light to go into a much higher gear on the space program." Subsequently, on 23 May, the President briefed Democratic congressional leaders on the substance of his forthcoming message dealing with the expanded space program.[17]

(U) On 25 May 1961 President Kennedy delivered in person to a joint session of Congress his second "State of the Union" message. Traditionally, he said, such messages were presented annually; however, "this tradition has been broken in extraordinary times. These are extraordinary times. And we face an extraordinary challenge." His message covered a number of important topics affecting the nation's and the world's well-being, among them the space program. Concerning the latter, he declared:[18]

> If we are to win the battle that is now going on around the world between freedom and tyranny, the dramatic achievements in space... should have made clear to us all...the impact of this adventure on the minds of men everywhere who are attempting to make a determination of which road they should take...It is time to take

*79.7 million instead of $29.5 million for Apollo; $15 million instead of $3 million for a large solid booster; and $23.5 million for the Rover nuclear propulsion rocket.

> larger strides--time for a great new American enterprise--time for this nation to take a clearly leading role in space achievements.

(U) The President referred to the recent re-examination of the national space program, the past U.S. failures to state specific goals and to marshal and manage its resources properly, and the early start of the Russians which gave them a space lead which they could exploit for some time to come. Therefore, "we...are required to make new efforts of our own. For while we cannot guarantee that we shall one day be first, we can guarantee that any failure to make this effort will make us last." [19]

(U) President Kennedy proposed four major space goals. The first and most important was to undertake and complete a manned lunar expedition before the end of the decade. This would involve broadened and accelerated development in spacecraft, large boosters, and other areas of technology and exploration. The second goal was to speed development of nuclear rockets for interplanetary exploration purposes. The third and fourth national objectives were to obtain a global communication satellite system and a global meteorological satellite system as quickly as possible. [20]

(U) Repeatedly the President emphasized that the final decision to embark on such an expanded space program rested with Congress and the American people. He warned that the burden would be heavy and the costs great--.531 million more in fiscal year 1962 and between 7 billion and 9 billion over the succeeding five years. Halfway measures or reduced goals were unsatisfactory; "it would be better not to go at all." The President warned that it was "a most important decision that we make as a nation. But all of you have lived through the last four years and have

seen the significance of space and the adventures in space. And no one can predict with certainty what the ultimate meaning will be of mastery of space." [21] Thus, it appeared that for the first time since Sputnik I, the United States would unequivocally accept the Soviet challenge for preeminence in space.

(U) The immediate impact of the Kennedy-proposed space program on the Air Force was small but significant. It would receive only $77 million of the half-billion dollar augmentation, to begin development of an upper stage and a large solid-fuel booster that would compete with the liquid-fuel Nova engine "until certain which is superior." But with this action the two-year embargo on military participation in the superbooster field had been lifted. From the long-range view, the Air Force optimistically expected that it would become a major participant in the enlarged space effort and that the new capabilities and techniques acquired in this extended effort would serve as building blocks to meet military requirements as they appeared.

III. AIR FORCE PLANNING FOR MILITARY SPACE ACTIVITIES

(U) Prior to the dramatic events leading to the expanded national space program, the Air Force had sought to identify and document its broad objectives in space and the specific operational capabilities required to achieve them. Theoretically, USAF's broad goals would first be published in an Air Force Objective Series (AFOS) paper, which would then provide the staff with general guidance for the preparation of a required operational capabilities (ROC) paper and a Research and Development Objectives (RDO) paper. However, as the situation developed during 1960-1961, this sequence was reversed. Publication of the ROC and RDO preceded by some nine months the issuance of the AFOS on Air Force long range concepts and views on military activities in space.

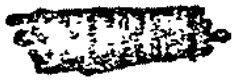
Airpower into Aerospace Power

(S) Early Air Force efforts to document its required operational capabilities, initiated in fiscal year 1960, continued into the current period and finally culminated in publication of ROC-1--"Required Operational Capaoility in Space, 1965-1975"--and a companion RDO. Drafted by the Directorates of Operational Requirements and Development Planning, these papers were presented to a joint meeting of the Weapons Board and Force Estimates Board on 12 August 1960. In an opening statement, Maj. Gen. Bruce K. Holloway, Director of Operational Requirements, said that

the subject was "one of the most important" that had ever come up before the boards. "We are all aware," General Holloway added, "of the pioneering efforts accomplished by Billy Mitchell, Hap Arnold, and Tooey Spaatz which have led to the present airpower represented by the U.S. Air Force. The time is now appropriate to pioneer even further and lay the groundwork for the extension of airpower into aerospace power."[1]

(S) The briefing began with a review of potential Soviet capabilities in space "during the next 15 years." By the late 1960's, according to the Assistant Chief of Staff for Intelligence, in the weapon area the Russians were expected to possess ICBM's with ablated protection, variable trajectories, high-speed re-entry vehicles, multiple warheads with decoys, and other refinements. In addition, it was estimated they would continue to emphasize space system development, including manned earth satellites, maneuverable manned satellites, space platforms, and a manned lunar program.[2]

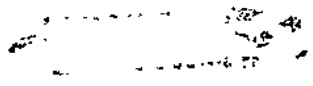
(S) Following the intelligence presentation, the proposed MOL was described by an official of the Directorate of Operational Requirements. Its purpose, he said, was to serve as a future guide "for identifying hardware, system concepts and development objectives" to be pursued by the Air Force. It called for developing a USAF capability to: determine the geodetic location of earth targets in hostile areas; provide continuous surveillance of enemy surface areas and adjacent areas for early warning, tracking, and target evaluation; and maintain continuous watch of enemy spacecraft, intercepting and inspecting them at close range, and destroying



them if appropriate. Other Air Force requirements were for systems or hardware that would enable it to: intercept enemy missiles and space vehicles during their boost or midcourse phase, which would eliminate the defensive problem of dealing with decoys and multiple warheads; strike surface targets from orbiting space vehicles, thereby shortening flight time from launch to target by taking advantage of orbital overflight and providing additional protection from surprise attack; and maintain and operate alternate command posts in space to assure survivable communications.

(S) The speaker noted that most of the above capabilities were nonexistent and that, together with the supporting advanced technology, they represented a military space program far more ambitious than the one currently being pursued. Nevertheless, it was necessary for the Air Force to initiate on an urgent basis the studies and required research in order to lay a foundation for future decisions. "In summary," one of the authors of ROC-1 concluded, "we are proposing leadership in the space environment... It is an extension of the 'higher, faster, and farther' of the past.[3]

(S) The boards quickly endorsed the proposed ROC and RDO papers, and on 20 September the Air Force Council and the Chief of Staff added their approval. In authorizing publication as official Air Force guidance, General White directed that other USAF planning and policy documents be "realigned" to reflect their contents. General White said that space operations would constitute a natural extension of existing USAF operations and that the new papers would provide guidance for development, basic research



and studies, and budgeting. Subsequently, on 30 September 1960, the Directorate of Operational Requirements disseminated ROC-1 and it became an authorizing document for undertaking system study efforts in a number of areas.[4]

USAF Views on Space Systems

(S) Shortly after publication of ROC-1, a related planning paper was prepared which sought to state in clear terms the Air Force's position on military space doctrine and concepts. Previously, the Eisenhower administration's policy of subordinating the military role in space had inhibited the Air Force from stating its position forcefully. However, the election of a Democratic President in November 1960 stirred hopes that this policy might be overturned and led to preparation of a paper by Brig. Gen. J.D. Page, Deputy Director for War Plans, setting forth a USAF rationale on space. Together with other papers, this planning document was to serve as a basis for briefing new administration officials.[5]

(S) The basic doctrine set forth by Page was that space systems were similar to missiles and aircraft and should be addressed in terms of their contribution to functional areas, rather than in terms of space as a medium. Thus, the Air Force deemed it inappropriate to talk about creating a separate "space command" (an idea previously supported by the Army and Navy) since such an organization would violate the basic premise of considering space systems on the basis of functions. Similarly, the Air Force derided any "concept for space" because this violated its position that aerospace was a continuous medium from the surface of the earth outwards.[6]

(S) The Air Force view was that basic requirements for space systems should be considered in the context of how they could help the services do their jobs better. In this connection, seven USAF or DOD systems in various stages of study or development were identified with definite military application. These included Samos, Midas, a space-based counter weapon system (SCWS), Saint, Spadats, Advent, and Transit.* In addition, four were identified in the current space program as being "learning type" projects to acquire new technological capabilities. They included Discoverer, Dyna-Soar, Aerospace Plane, and a hyper-environmental test system (HETS).* [7]

(S) In a separate discussion of Air Force relations with NASA, the planning paper expressed the view that the National Aeronautics and Space Act of 1958--which created the space agency--was "confusing" because it delimited responsibilities between DOD and NASA for system development. With reference to the emphasis placed on "space for peace," the Air Force position was to seek amendments to the existing law which would clearly recognize the military's role in developing space-oriented weapon systems.[8]

(S) Preparation of Page's document coincided with initiation of a USAF public and internal information program to disseminate Air Force views on space. This program, begun in late November 1960, included special briefings of congressmen, industrialists, journalists, and others. Unfortunately, the campaign almost immediately boomeranged when the press and trade journals chose to highlight what they termed was a major USAF "political offensive to bring about changes in national space policy and law." When an Air Force information policy letter on space was published

*These space systems are examined individually in succeeding chapters.

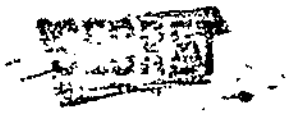
on 1 December, it also was interpreted as pointing to an impending battle with NASA for the dominant role in space. As noted above, these stories led the Brooks House Committee on Science and Astronautics to express concern over what seemed to be an Air Force-industry plot to undercut the space agency, and General White hurriedly assured that the Air Force had no such intentions.* 9

Military Objectives in Space

(C) When the new administration took office, the Air Force still was without an official AFOS paper defining its objectives in space. As early as March 1958, a draft had been prepared but was kept unpublished on advice of Secretary of the Air Force James H. Douglas, who questioned the wisdom of distributing it at a time when the Eisenhower administration was formulating its "space for peace" policies and programs. By December 1960, however, the Director of Plans, Maj. Gen. D.A. Burchinal, felt that the time was ripe for an AFOS that USAF officers, as requested by the incoming administration, could use to explain the official view "of the future of the Air Force in aerospace." 10

(C) During the early weeks of 1961 the Directorate of Plans prepared a draft which it circulated to interested staff agencies for comment. A near-final draft, completed by May, was forwarded to the Vice Chief of Staff, General Curtis E. LeMay, for approval. General LeMay decided, however, that because of its "sensitive nature" it required Office of the Secretary of the Air Force (OSAF) review and approval. Under Secretary Joseph V. Charyk subsequently approved its publication with only minor changes. On

*See Chapter I, p 5.

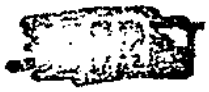


19 June 1961, the Air Force issued AFOS 2/2 under the title, "Long-Range Concepts as to the Nature of Future War, USAF Views on Military Activities in Space."[11]

(C) AFOS 2/2 noted that the key to military decisiveness throughout the ages was "access to targets." The nation that controlled access to vital enemy targets and could simultaneously deny the enemy access to its own territory was dominant in war. Space systems, because of their dramatically increased performances, were seen as a means of controlling from above weapon systems operating at lower levels in aerospace. Accordingly, future national power in peace and war would be greatly influenced and might be ultimately determined by space capabilities.[12]

(C) AFOS 2/2 restated the USAF position that space was "a continuous extension of the aerospace flight realm" in which the Air Force had operated since its inception. Expansion of military capabilities into space was seen as a fundamental and sequential development in the nation's long-established program of building quality systems with increased performance. "The United States already stands on the threshold of unparalleled advances," the AFOS said. "While the exact nature of all possible achievements cannot be defined in detail, it appears that specific space systems can be developed in the future which will permit the nation to accomplish certain military actions to enhance the national security." These ranged from the acquisition of geodetic information for accurate aiming of ballistic missiles to the extension of USAF weapon systems for area defense and defense in depth in aerospace.[13]

(C) To achieve an effective military space capability as soon as possible, AFOS 2/2 suggested a greatly expanded USAF effort in the following priority areas: manned exploration of space; in propulsion, to provide low-cost boost, maneuverability, and payload capabilities; aerospace medicine/life sciences research and development; ground facilities for space environmental testing; and basic and applied research, to define the space environment from an engineering and operational viewpoint.[14]



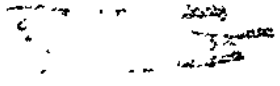
IV. SAMOS, MIDAS, AND DISCOVERER PROGRAMS

(U) The three major space programs pursued by the Air Force during fiscal year 1961 were Samos, Midas, and Discoverer. The first two were directly oriented toward obtaining intelligence of the enemy's activities, while the third was aimed at developing reliable space vehicles and space subsystems for a variety of military uses, including those for Samos and Midas.

Samos

(S) As earlier noted, the downing of a U-2 photo reconnaissance aircraft over the Soviet Union on 1 May 1960 led to both an acceleration and expansion of USAF's lagging Samos reconnaissance satellite program. During May and June, with the U-2 incident reverberating on the international scene, intensive planning activity within the Office of the Secretary of Defense (OSD) and the Air Force culminated in a revised program seeking to exploit as early as possible any reconnaissance data that might be obtained from Samos test flights.* On 10 June President Eisenhower formally asked Secretary of Defense Thomas S. Gates, Jr., to re-evaluate the program and brief the National Security Council (NSC) on intelligence requirements, the technical feasibility of meeting those requirements with Samos, and OSD's plans for the system. A team of three men--Dr. Charyk, John H. Rubel, Deputy Director of DDR&E, and Dr. George B. Kistiakowsky,

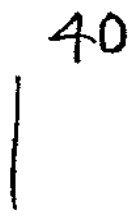
*The first Samos test flight, originally scheduled for April 1960, slipped to September and then October 1960.



the President's scientific advisor--was formed to make the study and to prepare a presentation. However, because of the need to resolve a number of management, development, and operational questions, it was not until 25 August 1960 that these officials were able to present their briefing to the President and NSC.[1]

(U) Within two days of the President's call for a re-examination of Samos, the Senate appropriations committee issued what the New York Herald Tribune termed an "unusual report." The committee said that it was "a matter of national emergency to move forward as rapidly as possible with the reconnaissance satellite program." Accordingly, it proposed to increase the fiscal year 1961 budget appropriation for Samos by $83.8 million more than the President's request. On the same day, 12 June, the then-Senator Johnson in a television appearance also proposed a "crash program" to develop a reconnaissance satellite system to replace the U-2.[2]

(U) These actions and statements gave impetus to the broadened review of the Samos project then under way, which included not only a technical realignment but also an examination of intelligence requirements and the management and organizational structure. The eventual product of these activities was a key decision by NSC and the President which, eliminating previous uncertainties, signalled the start of a highest priority program reminiscent of the wartime Manhattan effort and the current USAF and Navy ballistic missile programs.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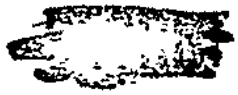
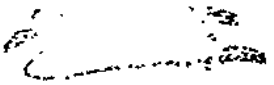
(U) Secretary of the Air Force Dudley C. Sharp wasted little time creating the recommended new structure and procedures. On 31 August he established the Office of Missile and Satellite Systems within his own office



to assist "in discharging his responsibility for the direction, supervision and control of the Samos project." The Secretary also designated Brig. Gen. Robert E. Greer, recently Assistant Chief of Staff for Guided Missiles and currently assigned to AFBMD, as Director of the Samos project. Greer was to organize a project office at AFBMD's California complex as a field extension of OSAF and carry out development of the satellite.[17]

(U) Sharp also established two advisory bodies. The first, the Satellite Reconnaissance Advisory Group, would consist of a standing committee of four--leaders in the field of electronics, photography, and data handling--augmented as occasion demanded by an assembly of technical experts to consider specific matters and make recommendations. The second advisory group--the Satellite Reconnaissance Advisory Council--would include Sharp's four top civilian aides, the newly created Director of the Office of Missile and Satellite Systems, and three Air Staff members: the Vice Chief of Staff, the Deputy Chief of Staff for Development, and the Assistant Chief of Staff for Intelligence. The role of the council was to "provide assistance, advice, and recommendations as required."[18]

(U) Under this pattern of management, the Air Force through its departmental head had retained executive control of Samos. USAF headquarters and the field commands, however, were virtually eliminated from all phases of planning and conducting the program. Previously, the Gillette procedures had at least permitted USAF headquarters a small degree of participation and cognizance over the missile program through retention of the AFBMC-AFBMD



point of contact--the Assistant Chief of Staff for Guided Missiles--within the Air Staff. This was not the case with Samos. On 13 September Secretary Sharp informed the Chief of Staff that "no intermediate review or approval channels" would exist between the Samos field office and OSAF. Moreover, briefings would be given on a strict need-to-know basis to Air Staff and other USAF representatives as required for Samos support purposes or in the coordination of related matters. From a formal standpoint, the only regular contact between the Samos organization and the Air Staff would be through the latter's three individual representatives on the advisory council.[19]

[redacted]

Midas

(U) The reorientation of the Samos program during the latter months of 1960 directly affected the Midas (missile defense alarm system) satellite project. Previously, the Air Force had planned to construct an integrated ground control and data processing network for both systems. This plan became obsolete with the Samos reorientation. However, the Midas program was affected negatively at this time by a more basic problem--serious technical difficulties[+] —that caused major changes to USAF plans. Specifically, new emphasis was placed on Midas technical development rather than on achieving an early operational capability as previously planned.

Background for Reorientation

(S) The decision to emphasize system development was made against a background of what appeared to be a growing Soviet ICBM threat to the United States. For example, early in July 1960 the Russians initiated a series of 8,000-mile ICBM test launchings into the Pacific to a target 1,000

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*As a consequence, there will be no further coverage of the Samos project in AFCHO histories until the strict information embargo is lifted.

+ By detecting infrared radiations emanating from booster exhausts, Midas theoretically was capable of providing up to 30 minutes warning of an ICBM attack. However, a major question remained unresolved whether the system would be able to differentiate between the rocket's emissions and the earth's natural infrared background radiation.

miles southwest of Hawaii. Subsequently, Soviet Premier Nikita S. Khrushchev cited the launchings as examples of Russian capabilities and threatened the U.S. with a rocket war if it intervened militarily in Cuba. Impelled by the nature of their mission to take Khrushchev's belligerency seriously, the North American Air Defense Command (NORAD) and Air Defense Command (ADC) urged the USAF Chief of Staff to accelerate the Midas program as much as possible.[21]

(S) General White's reply on 11 August was that such an acceleration was premature because of the many unanswered technical problems which "must necessarily pace the program." He also observed that the Secretary of Defense had not yet approved the original Air Force development plan, nor had JCS acted on the preliminary Midas operational plan. In addition, he noted the definite possibility that questions and reservations about system reliability in DDR&E might forestall early approval of either.[22]

(S) Dissatisfied with this situation and convinced that the threat facing the nation required an expedited and expanded program, Lt. Gen. J.H. Atkinson, commander of the Air Defense Command, and General Laurence S. Kuter, NORAD commander, conducted a review of Midas progress with AFBMD and Lockheed officials. Subsequently, on 16 August, they recommended to General White that additional Midas launchers and back-up be provided and that the development program be compressed in order to demonstrate feasibility and reliability as soon as possible. White replied on 27 August that ADC was preparing a revised Midas development plan and would be asked to provide for an augmented development program. He assured the two commanders he would support any reasonable request to the Air Force Ballistic Missile Committee and DDR&E.[23]

(S) Meanwhile, to expedite experiments to obtain essential technical data on the earth's infrared background radiation, the Air Force asked DDR&E to authorize two radiometric flights (RM-1 and RM-2) aboard Discoverer vehicles. On 19 August York gave his permission. Subsequently, RM-1 was successfully launched into orbit aboard Discoverer 19 on 20 December and obtained useful infrared data for 4½ days. The second radiation device was successfully launched into orbit aboard Discoverer 21 on 18 February 1961 and obtained valid data from six stable orbits. In addition to these experiments, the Air Force during the period used a high-altitude U-2 to collect further background infrared data while awaiting the launching of Midas III.* [24]

(S) In connection with the system's technical status and to answer the basic question whether Midas would really work, during 6-9 September 1960 a group from the President's Scientific Advisory Committee undertook a review of the program. This group, headed by Dr. W.K.H. Panofsky, Stanford University, concluded that despite major technical problems the Midas concept was sound, engineering difficulties could be overcome, and that every attempt should be made to achieve the proposed operational system in 1963.[25]

The Revised Midas Development Plan

(S) Acting on Air Staff instructions, AFBMD on 24 October 1960 issued a revised development plan which gave greater emphasis to Midas system

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*The first Midas, launched 26 February 1960, failed to achieve orbit. Midas II successfully orbited on 24 May 1960; however, it ceased to transmit data after two days.

development. The plan called for an accelerated flight test program (a total of 18) to insure confidence and system reliability. Three types of launchings were scheduled: Series II flight tests of the satellite equipment; Series III flight tests of vehicles used in conjunction with ground-based equipment; and Series IV flight tests of the complete operational system prototypes.[26]

(S) On 4 November the Air Force Ballistic Missile and Space Committee (AFBM&SC)* was br. ;fed and generally approved the revised development plan. However, it directed that all references to operational funding or capabilities be deleted and a new plan be submitted concentrating almost wholly on research and development. AFBMD subsequently prepared and, on 3 January 1961, issued a new development plan which called for six additional R&D launchings (for a total of 24). After reviewing the plan, AFBM&SC requested additional changes, including deferral of construction of a Midas tracking and control center. The "final" Midas development plan was completed by AFBMD on 31 March 1961. It called for 27 development launches, three more than previously planned. With suitable lead time, it estimated that an initial operational capability (IOC) could be achieved by January 1964. The total development program would cost $107.4 million in fiscal year 1961 and $201.1 million in fiscal year 1962.[27]

(S) Earlier, the Air Force submitted to the JCS a revised version of a preliminary Midas operational plan which was first issued in February 1960. As in the original plan, the revised version (dated 14 November) called for assigning operational command of the system to CONAD+ and operational control

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*Formerly the Air Force Ballistic Missile Committee, renamed in August 1960.
+Continental Air Command.

to NORAD. The Joint Staff, which during the spring of 1960 had been unable to agree about assignment of operational responsibilities, now endorsed the plan and recommended OSD approval. On 6 December and 16 January 1961 it was approved by the JCS and the Secretary of Defense.[28]

(S) Acting on this authority, on 13 February the Air Staff formally designated ADC as the "using USAF command" to represent it in all negotiations with NORAD. On 15 March ADC submitted its proposed Midas operational plan calling for an eight-satellite network, launch facilities, three readout stations, and other facilities. Provided adequate funding and go-ahead approval was given by July 1961, ADC felt that it could achieve an IOC by 1 January 1964.[29]

(S) But on 12 June 1961 Under Secretary Charyk pointed out to the Chief of Staff that the ultimate configuration of the operational system was dependent upon the degree of success of infrared techniques evolved during Midas research and development. Consequently, neither the IOC plan nor the extensive contractor effort under way to satisfy Air Force operational and logistic planning requirements appeared in order at this time. He urged de-emphasis and deferment of "operational and logistical planning actions," and concentration on the effort to demonstrate satisfactory early warning techniques. General LeMay agreed and on 22 June the Air Staff so directed the field.[30]

(S) This de-emphasis on operational planning, despite the feelings of urgency at ADC and NORAD, proved highly perceptive as the Midas R&D program ran into continuing technical difficulties in the months that followed.

Discoverer

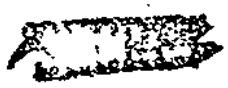
(U) The successes and achievements of the Discoverer program not only provided a welcome boost to free world morale during 1960-1961, but, much more importantly, they helped pioneer the launching, recovery, and other techniques so vital to the Samos, Midas, and other satellite programs.

(U) During this highly successful year, the Air Force launched 13 Discoverer satellites, successfully orbited 10, discharged 7 of the space capsules from orbit, and successfully recovered 5 of them. The most outstanding feat of the period occurred on 11 August 1960, the day after Discoverer 13 was launched into its planned polar orbit. On the 17th orbit, or after 16 passes around the earth, the data capsule was ejected from its second-stage Agena vehicle and re-entered the earth's atmosphere in the vicinity of Hawaii, where it was retrieved from the ocean. This event marked the first time in history that a man-made objective had been successfully recovered from space and was one of the few significant "firsts" that the United States had achieved to date. During a White House ceremony on 15 August, General White presented a special 50-star American flag from the capsule to President Eisenhower.[31]

(C) The recovery of this and subsequent Discoverer capsules helped Air Force efforts to expand the program in support of other projected systems. Thus, on 26 August, the Air Staff directed AFBMD to revise the Discoverer development plan to show an increase of six vehicles, to a total of 41. This revised plan, together with schedule and funding changes, was completed in late November and approved on 27 December 1960. In authorizing the

expanded program, Assistant Secretary of the Air Force T.S. Garlock specified, however, that it should remain within certain funding limitations.[32]

(C) In March 1961 the program got a boost from President Kennedy when he asked Congress for an additional $30 million to expand the program still further. In early May the Air Force revised the Discoverer development plan once again, increasing the total flight program to 44 vehicles, compared to the authorized program of 35 at the beginning of the period.[33] By 1 July 1961 the Air Force had launched a total of 26 Discoverer satellites since inception of the firings on 28 February 1959.



V. THE DYNA-SOAR PROGRAM

(C) During the summer of 1960 the Air Force initiated development work on its much publicized Dyna-Soar, considered by USAF officials to be a logical avenue for exploring man's capabilities to execute military missions in space and the nation's best hope for developing maneuverable, piloted space vehicles. Although the Air Staff previously had hoped to pursue Dyna-Soar as a full weapon system development, DDR&E restricted the program to Step I--the suborbital exploration of hypersonic flight up to a velocity of 22,000 feet per second. York's position was that there was no specific requirement for Dyna-Soar and that he had only approved it as a "contingency program" which, "if there should develop important manned military space systems, where it is important to get the man up and down fairly fast...in a well-controlled fashion," could be accelerated.[1]

(S) In August 1960 York released $58 million in fiscal year 1961 funds to enable the Air Force to proceed with Step I Dyna-Soar suborbital glider development. With these funds, the system contractor--the Boeing Co.*--was able to push vehicle design and settle on most of Dyna-Soar's major structural and aerodynamic features. On 22 September USAF Deputy Chief of Staff for Development, Lt. Gen. Roscoe C. Wilson, publicly unveiled a full-scale model of the vehicle in San Francisco.

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*The Boeing prime contract was let on 27 April 1960. On 8 June the Air Force approved selection of the Martin Co. as associate contractor responsible for the booster frame, and on 27 June Aerojet General as booster engine developer.

On 6 December the Air Force selected Minneapolis-Honeywell Regulator Co. to develop the primary guidance subsystem, and on 16 December Radio Corporation of America (RCA) as subcontractor for the communication and data link subsystems.[2]

A Change of Boosters

(S) To support the Step I program, the Air Force planned to use a modified Titan I ICBM as the Dyna-Soar booster. This two-stage vehicle was capable of producing 360,000 pounds of thrust, sufficient to propel Dyna-Soar to a velocity of 19,000 feet per second on a suborbital flight. The first Titan I Dyna-Soar launch was scheduled for July 1964. However, in November 1960, Courtland Perkins, the Assistant Secretary of the Air Force (R&D), after being briefed on the above plan, observed that Titan I would be a marginal booster for this purpose. Perkins asked the Air Staff to examine the feasibility of using Titan II for the suborbital flights, plus a combination of Titan II first stage and a Centaur-type second stage for the orbital program. Major advantages of Titan II were that it employed storable propellants and could produce an additional 150,000 pounds thrust.[3]

(S) Concern over the reliability of Titan I was seemingly substantiated on 3 December 1960 when a catastrophic explosion of the missile during a test exercise at Vandenberg AFB destroyed an entire launch complex. ARDC subsequently reviewed the Perkins suggestion and compiled data on factors bearing on use of Titan II rather than Titan I. This information was presented to the Assistant Secretary on 21 December and confirmed his view that Titan II would prove superior. However, Perkins now cautioned Air Force

officials about an impending financial problem growing out of the last Eisenhower budget, which restricted Dyna-Soar expenditures during fiscal year 1962 to only 70 million. A changeover to Titan II would aggravate the funding problem.[4]

(C) While acknowledging this situation, the Air Force now was eager to adopt Titan II since it promised substantially improved performance. On 6 January 1961 ARDC formally recommended the substitution and was supported by the USAF Director of Aerospace Systems, Maj. Gen. H.C.Denler. At Dr. Perkin's suggestion, General Denler prepared a special summary highlighting the advantages of Titan II over Titan I. Among other things, General Denler said that Titan I would barely be sufficient to achieve Step I objectives and could not be modified to provide orbital velocities for the glider. He also reported that the switch to Titan II would cost only an additional $4.2 million. On the basis of these arguments, the Strategic Panel and Weapons Board approved use of Titan II in lieu of Titan I.[5]

(C) Subsequently, Air Staff representatives briefed John H. Rubel, Deputy Director DDR&E, who acknowledged the technical merits of the more powerful booster, and on 11 January Headquarters USAF informed ARDC that the use of the Titan II booster had been approved.[6]

Efforts to Accelerate the Dyna-Soar Program

(S) Although Dr. York had limited Dyna-Soar development to the boost glide flight regime (Step I), the Air Staff remained anxious to push

on toward orbital and ultimately weapon system development. Toward this end, the Air Force on 21 July 1960 issued a system development requirement (SDR) for a Step II manned glider system capable of demonstrating orbital flight and controlled re-entry and landing. The SDR envisioned such a vehicle as leading directly to Step III--the development of various military systems based on Dyna-Soar technology.[7]

(S) A similar objective was also stated in the 12 October development directive that the Air Staff issued to cover the approved Step I suborbital R&D program. It authorized ARDC to proceed with planning for the second step "concurrently with Step I and with the closest possible correlation maintained between the efforts." ARDC was further directed to initiate a "concurrent aggressive study effort" in the area of military applications of the Dyna-Soar concept "as a basis for possible future Step III weapon system development programs." In addition, the development command was asked to formulate a "stand-by" plan for achieving orbital flight with the Step I glider, should such action be directed by higher headquarters.[8]

(C) ARDC submitted the plan to Headquarters USAF in March 1961, recommending the merger of Steps I and II into a continuous development that would use the same booster for both suborbital and orbital flights. If the recommendation were accepted, ARDC estimated the first manned orbital flight could be accelerated by as much as 17 months over the existing schedule, to November 1964. ARDC said such an accelerated program could use either a Titan/Centaur combination or the Saturn C-1 booster and would cost less than the combined cost of the currently planned Step I-II program.[9]

(U) These recommendations were received just prior to the orbital flight of Maj. Yuri Gagarin on 12 April, and the latter event had the effect of stimulating congressional interest in a possible acceleration of the Dyna-Soar program. For example, the chairman of the House subcommittee on DOD appropriations, Representative George H. Mahon, criticized NASA's Project Mercury when during a committee hearing on 1 May, he said, "Everyone remembers that Charles Lindbergh was the first man to make a solo flight across the Atlantic Ocean. The name of the second man to accomplish this feat has been generally forgotten." Mahan suggested there might be little advantage "in continuing to pursue the Mercury program" and he asked two USAF witnesses present--Under Secretary Charyk and General Wilson--whether "the orbiting of a man in a vehicle over which he has some degree of control and which he can land at an Air Force base" might not be considered a major scientific achievement.[10]

(U) Both Air Force officials emphasized, of course, the importance of controlled, maneuverable space vehicles. General Wilson particularly expressed his firm conviction that Dyna-Soar was "the most important program we have in the Air Force because we will never be able to talk about space flight until we are able to take off at the pilot's option, control the vehicle and return it at the pilot's option...This Dyna-Soar program represents the genesis of space flight. This will be the first time man will be able to fly in space..." In response to a congressman's question whether Dyna-Soar could be expedited, Wilson said more money could be spent effectively to enhance the program.[11]

(U) In the weeks that followed, at the request of General Schriever, the Boeing Company prepared a revised Dyna-Soar program ("Project Streamline") which it said could achieve manned orbital flight three years sooner and at a savings of some $300 million. On 24 May the Air Staff, after reviewing Project Streamline and the preliminary "stand-by" plan, directed AFSC to submit a new plan which would accelerate the first manned Dyna-Soar flight by 2½ years.[12]

(U) In June congressional support for an accelerated program took concrete form. The House Committee on Appropriations, in a final report on the 1962 defense appropriation bill, endorsed the advantages of "an operational, manned, military space vehicle over which the pilot has the greatest possible control" and declared that Dyna-Soar was "the quickest and best means of attaining this objective." The committee complained, however, that past Dyna-Soar planning had lacked boldness and imagination. The costs of such programs, when pursued at less than optimum pace, mounted up and personnel remained on the payroll for longer periods of time.[13]

(U) Since an accelerated program promised lower costs and early orbital flight, the committee thereupon voted to increase the Dyna-Soar appropriation to $185.8 million for fiscal year 1962--$85.8 million more than requested by President Kennedy.* Arguing for support of this increased expenditure, the committee said (in words which expressed the Air Force viewpoint) that:[14]

> The Dyna-Soar program is not competitive with the proposed space flight to the moon program announced by the President. The objectives of the Dyna-Soar are military. The potential military applications of the program are important. For the remainder of this decade the space area close to the earth's surface will be of greater interest to military planners than will the area around the moon.

*In March 1961 President Kennedy added $50 million to the revised 1962 budget, bringing the total to $160 million.

(U) At the close of the period, these and other proposals to accelerate the program were being studied by the Secretary of Defense. Several months later they led to a decision by McNamara to proceed directly to an orbital flight program, eliminating the Step I suborbital flights as was recommended by the Air Force.

Dyna-Soar Management

(C) Early in April 1961, in a memorandum to the Deputy Chief of Staff for Development, General White asked what if anything could be done to tighten and improve Air Force management of the Dyna-Soar program. In response, General Wilson reviewed for the Chief of Staff the management controls established over the field program which he viewed as exemplary. The key field agency was a system project office at Wright-Patterson AFB, under the Aeronautical Systems Division. Within the project office, the system program director, deputies for engineering and materiel, the test force director, and their assistants formed the Dyna-Soar project staff.[15]

(C) However, General Wilson noted that within Headquarters USAF, although the project had received consistent and full Air Staff support, the established Air Force position had not always been effective in influencing decisions of OSAF and the Secretary of Defense. He recommended, as one way of improving top-level management, that Dyna-Soar be assigned to the Air Force Ballistic Missile and Space Committee,* and be designated a system requiring maximum support.[16]

(C) White approved this recommendation and on 5 May General LeMay formally asked OSAF to assign the project to AFBMSC as a designated system

*On 25 July 1961 the committee was reorganized as the Designated Systems Management Group.

program. Dr. Charyk, however, disagreed. He pointed out that the Dyna-Soar program still was in Phase I and "primarily oriented to applied research." Accordingly, assignment to the committee should be deferred "until the program reaches a point where serious consideration should be given to a Phase II or follow-on effort." [17]

VI. AIR FORCE SOLID BOOSTER PROGRAMS

(U) The major advantage possessed by the Soviet Union in the space race with the United States stemmed from its superior boosters. And it repeatedly demonstrated this advantage. For example, on 19 August and 1 December 1960 the Soviets launched two "spaceship satellites" into orbit, each weighing more than 10,000 pounds and both carrying a variety of animal life including dogs. The first of these vehicles, after a day in space, re-entered the earth's atmosphere on command and safely returned its cargo to the Soviet Union. The following day the dogs, Strelka and Belka, were flown to Moscow and displayed as Soviet "heroes" to the world press. The second Russian recovery effort failed, however, and its animal cargo was destroyed on re-entry. Nevertheless, these launchings set the stage for the successful flight of Gagarin the following April.

(C) America's inferior booster capability,* which had long been obvious to the world, took up a major section of the Wiesner committee report to President-elect Kennedy in January 1961. "The inability of our rockets to lift large payloads into space," the committee declared, "is the key to the serious limitations of our space program. It is the reason for the current Russian advantage in undertaking manned space flight and a variety of ambitious unmanned missions." To balance Soviet achievements, the committee recommended development of boosters with a great weight-lifting capacity as "a matter of national urgency." [1]

*The most powerful U.S. rocket at this time was the Atlas-Agena combination, which could place only about 5,000 pounds of equipment into earth orbit.

(U) This official recognition of the U.S. requirement for more powerful space boosters, together with the recommendations of the Gardner committee and the McNamara-Webb proposals, several months later led to assignment to the Air Force of a key developmental role in the large solid propellant motor area. It also set the stage for development of various other solid fuel booster combinations which were proposed by the Air Force.

Origins of the Large Solid Rocket Program

(U) In 1958, not long after it had initiated its Minuteman solid propellant ICBM development program, the Air Force became interested in the possibilities of building even larger solid rocket motors. At its request, several Minuteman contractors drew up designs for a solid rocket unit delivering more than one million pounds of thrust. During fiscal year 1960 these plans led to the Air Force award of a $1.3 million contract to the Aerojet-General Corporation to initiate a program that demonstrated the feasibility of large solid rockets, and a $318,000 contract to Grand Central Rocket Co. to design, fabricate, and test motors, 36 inches in diameter.

(S) In August 1960 the Air Force awarded new contracts to these firms, totalling $3.3 million, to continue their work. Six months later, on 26 January 1961, the development program chalked up a major milestone when Aerojet successfully fired a 20-ton 65-inch solid motor segment which produced some 400,000 pounds of thrust for 19 seconds.[2]

(S) At this time, however, the Air Force was unable to pursue a full-scale solid rocket program because "superbooster" development was a NASA responsibility. The space agency since 1959 had centered its efforts on

development of large liquid propellant motors including the Saturn clustered rocket (capable of placing 19,000 pounds into a 300-mile orbit) and the F-1 Nova rocket motor, a single chamber 1.5-million pound thrust booster slated for use in lunar explorations. NASA belatedly became interested in the potentialities of large solid boosters and in the fall of 1960 awarded contracts to Aerojet, Grand Central, and Thiokol Chemical Corporation to conduct preliminary design studies on "super-size solid-fuel boosters." A fourth firm, United Technology Corporation, also was engaged in research for NASA in the solid rocket field.[3]

(S) In February 1961 the Aeronautics and Astronautics Coordinating Board (AACB),* after preparing a summary of the existing national launch vehicle program, suggested that when more knowledge was gained "it may be very desirable to provide a solid propellant booster rocket for space work, and thus gain... the advantages of simplicity, reliability and low-cost generally associated with solids." Under Secretary Charyk informed a congressional committee on 22 February that these Air Force/NASA studies indicated there would be a substantial cost advantage in using large segmented solid boosters and that both agencies were supporting research studies to establish their feasibility. If these proved successful, he said serious consideration would be given to development of large solid motors for space launchings.[4]

(U) Interest in an expanded solid propellant program grew during March 1961 when the House Committee on Science and Astronautics conducted hearings

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*A joint NASA-DOD agency formally established on 13 September 1960. The board was organized into a number of panels, including the Launch Vehicle Panel whose first chairman was Dr. Perkins, Assistant Secretary of the Air Force (R&D).

on space propulsion technology. Several industry spokesmen testified that they could build three-million pound thrust solid boosters with leadtimes substantially reduced over those needed to develop liquid propellant motors of similar thrust. An Aerojet-General official also claimed that development costs would be lower and that the solid versions would be more reliable and easier to handle because the segmented concept facilitated transportation, manufacturing, and inspection. The House committee was sufficiently impressed by these arguments to vote $15 million to pursue large solid motor development--four times more than requested by President Kennedy.[5]

(U) In the superbooster area the President's amended 1962 budget, submitted to Congress on 28 March, emphasized an expansion and acceleration of NASA's liquid propellant motor programs--Saturn, Nova, and Centaur. The President asked for more than $100 million in additional funds to support the accelerated programs, but accepted the Eisenhower request of only $3 million for solid booster development. It was not until after the Gagarin flight that the administration decided to "hedge its bets" with a substantially increased solid rocket program.

(S) Thus, following the Russian flight, the President's Scientific Advisory Committee organized an ad hoc committee on boosters and invited industry representatives to present their case for large solid boosters. On 29 April the Air Force briefed the panel on a special study of a family of space boosters (designated the Phoenix study) and its proposals for developing large solid propellant motors.* [6]

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*The panel later recommended development of a three-million pound solid motor.

(S) The Air Force, in its proposed national space program submitted to Secretary McNamara on 1 May, also suggested constructing solid segmented motors as a first stage, topped by liquid oxygen-hydrogen upper stages. This suggestion, as noted earlier, was adopted along with others by Secretary McNamara and Administrator Webb in their report to Vice President Lyndon Johnson on 8 May. Specifically, they recommended accelerating the development of both liquid fuel and solid fuel boosters, with the latter assigned to DOD (Air Force) and funded during fiscal year 1962 at $77 million.* [7]

(S) While the President was preparing his 25 May address to Congress which incorporated these recommendations, the Space Systems Division (SSD) submitted a proposed program plan to Headquarters USAF. It called for augmenting Aerojet-General's basic research by adding another contractor and constructing new test and launch facilities at the Atlantic Missile Range. The SSD plan emphasized development of "building blocks"--segmented motors with diameters from 100 to 140 inches, burning times from 60 to 90 seconds, and weights from 50,000 to 100,000 pounds. It contemplated development time at 30 months.[8]

Detailed Development Planning

(S) On 3 June 1961 the advocates of solid propellant motors appeared to have proved their case with Aerojet's successful firing that day of a three-segmented 100-inch diameter solid motor which delivered 450,000 pounds of thrust for 45 seconds. It was believed to be the most powerful solid rocket ever fired and was an auspicious beginning for the detailed planning

*Of this some $15 million was provided to begin development of a hydrazine/flourine upper stage for use with the Titan II booster.

effort which followed. On 5 June Secretary McNamara, in a meeting with Under Secretary Charyk, emphasized that the Air Force in exercising its new responsibilities must be responsive to NASA's requirements, performance, and schedules. He asked Charyk to submit a development plan for the solid booster program, which would include all development aspects through flight testing.[9]

(U) The new USAF program was to be pursued as a backup to the liquid propelled Nova vehicle until it became clear which was superior for the lunar mission. The Air Force, however, hoped that the solid propellant program would have important offshots to meet future military needs, although Dr. Harold Brown, DDR&E,* expressed some doubts about what these requirements might be. "I don't think," Brown said on 12 June, "that anyone can state right now a payload and mission combination which they can justify from a military point of view that demands larger boosters than are now or will be available under presently planned military programs." However, he said that if something did come up, "we will have them."[10]

(S) Meanwhile, NASA and SSD prepared a white paper covering management aspects of the solid booster project. In forwarding the document to the Air Force on 10 June, General Schriever, AFSC commander, asked that he be given sufficient management latitude over the program to provide for future use or application to USAF projects. He recommended that the Air Force provide funds beyond fiscal year 1962 for the development portion of the program and that NASA fund production items to be used during the test firing phase. Charyk forwarded the paper to Dr. Brown and emphasized that it would be

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*Dr. Brown succeeded York on 3 May 1961.

necessary for the Air Force to have "substantive responsibility" for the development program.[11]

(S) Early in June SSD also submitted a preliminary development plan for segmented solid boosters weighing about 750,000 pounds that could deliver up to three million pounds of thrust. The proposed motors would be 124 inches in diameter and have a 90-second burning time. SSD believed that ground tests could be conducted 18 months after project approval (a view considered optimistic by NASA), and vehicle flights by 1965. Pending receipt of NASA specifications, SSD estimated costs of the program would total $184 million for motor development through fiscal year 1966, $8 million for test facilities, and $747 million for production facilities and procurement.[12]

(S) In commenting to the Vice Chief of Staff on the SSD development plan, Charyk emphasized that he and Dr. Brown felt it desirable to limit the motor diameter to one permitting air transport (which he thought might be about 125-130 inches). Even with this restriction, he said, a suitable cluster to meet NASA's lunar requirements appeared possible. He suggested that because of the program's importance, the Air Force should adopt special procedures to ensure its success.[13]

(S) In the meantime, the Air Staff was also reviewing other solid/liquid motor combinations proposed in the Phoenix study. Begun by the Space Technology Laboratories and completed by Aerospace Corporation, the Phoenix study embodied the unique concept of attaching solid rocket, first stage engines in a parallel arrangement to a basic "A-stage" oxygen/hydrogen engine. Drawing upon the results of this study, SSD recommended to the

Air Force that segmented motors might be profitably wrapped "around a liquid rocket engine second stage to keep overall vehicle height to desirable limits. One application of this technique could be used with Titan II as a booster for Dyna-Soar II." [14]

(U) Although no concrete actions were taken on this suggestion before the end of the fiscal year, in the months that followed the recommendation became the basis for new rocket booster proposals which led to Titan III.

The Blue Scout Program

(U) Blue Scout, the only other active Air Force solid rocket development program, was essentially completed during the period. A high altitude and orbital research vehicle being procured by NASA, Blue Scout was the Air Force version of a NASA four-stage booster whose development began in 1958. The first successful launch of a Blue Scout occurred on 21 September 1960 at Cape Canaveral, when it boosted a payload of 32.8 pounds to an altitude of 16,600 miles. The Air Force during the year also launched five other Scouts of various configurations, three of them successfully. The highlight of the year's launch activity, however, involved a NASA Scout which on 16 February 1961 became the first solid propellant booster in history to launch a satellite, Explorer IX, into earth orbit.[15]

(U) Earlier, in September 1960 NASA undertook a survey of national requirements for Scout, including not only those of NASA and the Air Force, but also a Navy-expressed requirement for a Sea Scout version for possible use in its Transit navigation satellite program. Under its 609A hyper-environmental test system (HETS) program, ASD development officials had

established a requirement for four different Scout configurations: in addition to the basic vehicle configuration, designated Blue Scout, there were three other versions called Blue Scout I, Blue Scout II, and Blue Scout Junior.

(S) The Air Force stressed that these differing configurations were necessary to support its individual experiments, requiring such things as modified guidance and control systems for stabilization of payloads, structure modifications, etc. Not unexpectedly, however, the multiple configurations led to criticism within OSD and, in February 1961, to a review of the Scout program by the AACB's Launch Vehicle Panel. The panel reviewed NASA and Air Force reasons for the differing configurations and the existing program management structure. Concerning the configurations, Air Force officials explained to the panel that the operational vehicles were essentially standard units capable of being assembled in different combinations to fulfill particular missions. On this basis, the panel subsequently approved all of the various configurations. On the management question, the panel also confirmed NASA as the single agency responsible for Scout technical direction and procurement, but it suggested that the Air Force assign personnel to NASA's Scout launch vehicle project office to improve program coordination.[16]

(U) DDR&E was not satisfied with the management arrangement and, in May, asked NASA and the Air Force to suggest alternatives, including possible transfer of responsibility to USAF. On 1 June, the two agencies submitted a Scout/Blue Scout "white paper" to DDR&E. Commenting on it, the Associate Administrator of NASA, Robert C. Seamans, Jr., expressed

the opinion that none of the proposed arrangements was sufficiently advantageous to warrant any management changes. The Air Force, on the other hand, recommended transferring the entire program management to its control. An alternate USAF recommendation, if NASA would not agree to the above, was to give Air Force its own Blue Scout procurement responsibility. At the close of the period discussions between the two agencies and OSD were continuing.[17]

V. THE SAINT PROGRAM AND SPACE COUNTER WEAPONS

(S) When the Soviet Union began orbiting five-ton spacecraft during 1960-1961, it seemed to many in the Air Force that the nation faced a real danger in the form of Russian satellites used for reconnaissance, communications, early warning, and possibly bombardment. Studies to counter the last of these possibilities had been initiated by the Air Force as early as 1956; however, it was not until 1959 that it proposed to OSD a concrete plan for the Satellite Intercept and Inspection System (Saint). In June 1960 DDR&E authorized the start of a development program but in giving his approval York restricted the effort to demonstration of the engineering feasibility of a co-orbital satellite system.[1]

Saint Development Planning

(S) The original Air Force concept called for development of an inspector/killer interceptor satellite which would be ground-launched on order of NORAD. The final stage vehicle or interceptor would be boosted into the same orbit as the target and would search for, detect, and home-on the hostile satellite. After rendezvous at 50 feet, the vehicle would then maintain position for an extended period while inspecting the target with a variety of sensors including television cameras. Data obtained from the inspection would be transmitted to ground readout stations, processed, and

displayed at NORAD. If it were determined that the enemy vehicle had a hostile intent, the target would be destroyed on command from the ground by a salvo of small satellite-launched spin-stabilized high explosive rockets.[2]

(S) In line with York's guidance, AFBMD issued a revised Saint development plan which called for design, fabrication, and launching of four prototype vehicles which could demonstrate the feasibility of satellite rendezvous and inspection. The vehicles, which would carry the killer rockets, would be boosted into orbit by an Atlas-Agena combination. On 15 July the Air Force Ballistic Missile Committee approved the revised plan with one major exception. Under Secretary Charyk directed the Air Force to eliminate all references and work on a "kill" capability and to reorient the proposed system to "inspection" only functions. Supposedly, this step was ordered in concert with President Eisenhower's "space for peace" policy.* [3]

(C) The above changes were incorporated into a new development plan dispatched to OSD on 21 July, and York approved it on 25 August. Subsequently, the Air Force invited development proposals from industry. A source selection board reviewed the several industry proposals and, in November 1960, selected the Radio Corporation of America to develop the Saint final stage vehicle and payload. Contracts also were let to Convair and Lockheed to provide the Atlas-Agena boosters for the program. Charyk approved these contracts on 25 November."

*On 21 September, in a related decision, the NSC directed that any tests involving destruction of a satellite or space vehicle would not proceed without specific presidential approval.

(C) In December, however, a problem arose which threatened to halt the development program before it had begun. The Air Force had requested a fiscal year 1962 appropriation of $32 million for the project but when the final Eisenhower budget was released it showed a drastic reduction in funding for Saint. Because of the cutback, Assistant Secretary Perkins suggested to the Air Staff that it delay the entire project until the situation clarified. He said that the Air Force might have to abandon Saint to fund other programs and, in any event, proper funding would have to await the inauguration of the Kennedy administration. The Air Staff disagreed, and stressing the importance of Saint, asked to continue contract negotiations despite the reduction in funding. Early in January 1961, after re-examining the subject, Secretary Perkins reversed himself and agreed that the project should proceed on a stretched out basis.[5]

(C) On 1 February 1961 the Air Force negotiated a work statement and contract with RCA based on reduced fiscal year 1961 funding of $6 million and fiscal year 1962 funding of $12 million. Two months later, however, the Kennedy administration announced a more liberal attitude toward Saint. In his revised budget sent to Congress on 28 March, the President asked for an increase of $14 million to support the program, bringing the total 1962 appropriation to $26 million. The Air Force thereupon reverted to its original plans calling for a four-flight test program, with the first launching scheduled for March 1965. Later, during May, OSD also released $2.15 million in fiscal year 1961 funds which restored the full amount the Air Force had programmed the previous fall.[6]

(U) In June the project was reviewed by Dr. Brown for the Senate Committee on Aeronautical and Space Sciences. Saint was being developed, he said, "because we believe that we must have the capability to inspect any unidentified space object to determine its characteristics, capabilities, or intent." Brown said this might be done with unmanned satellites capable of maneuvering to intercept unidentified spacecraft and that the results of the planned test flights would enable OSD to determine the feasibility of the Saint approach. He added that manned inspection of satellites ultimately might be necessary.[7]

The Space Counter Weapon Program

(U) Somewhat related to the Saint project was an ARPA-USAF effort to define and develop some sort of active ballistic missile defense system. The urgent need for such a system was re-emphasized in July 1960 during a new series of Soviet ICBM test firings into the Pacific 1,000 miles southwest of Hawaii. The arrival of dummy stages which flew an 8,000-mile course from the Soviet Union was witnessed by U.S. Navy aircraft observers. Premier Khrushchev, as noted earlier, lost no time in citing the tests as evidence of Communist capabilities and threatening the United States with a rocket war over Cuba.[8]

(S) The nation's defenselessness against intercontinental missiles had been obvious since Sputnik I. However, despite this critical situation, ways and means of developing a realistic defense continued to resist the best minds in the nation. The only active U.S. program under development

was the Army's Nike-Zeus, a terminal defense system which the Air Force considered to be inadequate to protect the nation. In the USAF view, a more promising approach would be to try to halt the enemy missiles as far away as possible, before they arrived over the United States. Seeking to develop hardware proposals along this line, the Air Force supervised studies of advanced anti-ICBM concepts under ARPA's Project Defender, a program for research on ballistic missile defense. These studies centered on possible ways of destroying the missiles during their relatively slow boost phase. Designated Ballistic Missile Boost Intercept (Bambi), this concept was closely tied to early detection of enemy missiles through infrared emissions from rocket exhausts, a technique identical to that being employed in the Midas program.[9]

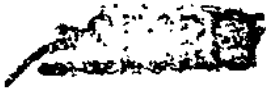
(S) The Bambi plan called for placing interceptor missiles into orbit to detect, intercept, and destroy hostile ICBM's before they had completed the powered portion of their flight, thereby protecting not only U.S. military targets but also the civilian population. To refine the Bambi concept, a number of general system studies were pursued under Air Force contract, but supported by ARPA funds. One of these, a Convair proposal for a Space Patrol Active Defense (Spad) system, would orbit more than 500 satellites, each armed with a number of tiny interceptors to destroy the enemy missiles. A variation of this proposal, offered by Ramo-Woolridge, called for a Random Barrage System (RBS). A third concept, submitted by Lockheed in August 1960, proposed two layers of satellites, one with Midas-type equipment orbiting at 2,000 miles altitude for detecting enemy launches,

the second orbiting at 400-500 miles altitude for tracking and relaying data to the ground. Destruction would be by a Minuteman-type interceptor launched from ground bases near Soviet territory.[10]

(C) ARPA and ARDC evaluation teams reviewed these studies in the late summer of 1960 in an effort to decide upon advanced "system concept" studies. Based on this review, ARPA on 12 October authorized the Air Force to solicit additional one-year system design studies to include concepts other than those which had previously been accomplished. However, it also authorized the Air Force to seek reoriented and improved concept studies based on the Spad and RBS proposals.[11]

(U) In the meantime, at OSD's suggestion the Air Force established an ad hoc committee of the Scientific Advisory Board to evaluate the available proposals for an anti-ICBM defense system. The report of this committee, dated 3 November 1960, concluded that the basic concepts appeared valid but that system feasibility would require much more basic scientific data on missile and background infrared radiation phenomena than currently was available. The committee recommended that the Air Force sponsor additional studies of different systems based on Bambi concepts and also undertake an intensive applied research program to develop reliable components.[12]

(S) To implement these suggestions the Air Force sought an appropriation of $50 million to support studies and research during fiscal year 1962. OSD and the Bureau of the Budget, however, refused this request and also eliminated $8.2 million in fiscal year 1961 funds which had been in a deferred status. Despite this setback, the Air Force continued to support the Bambi



concept as the most promising for ballistic missile defense. On 17 March 1961 the Chief of Staff authorized the Air Staff to take steps to obtain the immediate assignment of Bambi to USAF and to begin an expedited applied research effort. When feasibility of the concept was proved, it could then proceed to request funds for development.[13]

(U) In April 1961 the entire area of ballistic missile defense was reviewed by a joint ARPA/DDR&E task group, which concluded that the outlook for any successful active program was bleak. According to Dr. J.P. Ruina, the Director of ARPA, there simply were "no quick or easy solutions." Testifying before the House subcommittee on DOD appropriations, Dr. Ruina said that the Bambi concept of destroying a missile at launch was "the most forward looking one and has the greatest potential if it works." He added that none of the existing anti-ICBM proposals, however, warranted a larger expenditure of funds than already provided.[14]

(U) The gravity of the situation nevertheless continued to agitate the Air Force and ARPA. In May 1961, after further discussions between the two agencies, ARPA agreed to provide the Air Force additional funds and authorized the negotiation of new one-year contracts with Hughes, Convair, and Space Technology Laboratories for some $4.1 million of advanced Bambi conceptual studies.[15] They hoped that the results of these latest studies would enable OSD to decide upon a specific development plan by July 1962.

VIII. THE SPACE DETECTION AND TRACKING SYSTEM

(S) During 1960-1961 a number of OSD-directed management changes were made affecting the nation's system for detecting, tracking, and determining the orbital paths of all earth satellites. The existing system had been improvised immediately after the launching of Sputniks I and II. At that time all available detection sources, including cooperating foreign observatories, were asked to provide data to a computing center established at the Air Force Cambridge Research Center (AFCRC), Hanscom Field, Mass. This rudimentary satellite observation program formed an interim space detection and tracking system (Spadats) which included the Air Force's Spacetrack--the data filtering and cataloging center at AFCRC which received inputs from radars in Turkey, Shemya, Alaska, an ARDC test facility at Laredo, Texas, Baker-Nunn cameras and other sensors--and the Navy's Spasur (space surveillance) radar net. ARPA, which was program manager and supported the overall research and development effort, designated the AFCRC facility as an interim National Space Surveillance Control Center (NSSCC).[1]

Decision on Operational Responsibility

(S) Since the system possessed only a limited detection and orbital prediction capability, ARPA in April 1960 directed the Air Force to prepare a conceptual design plan for an improved system to meet the nation's future needs. ARDC completed this plan in late June, calling for a four-step

Military Uses of Space: 1946-1991

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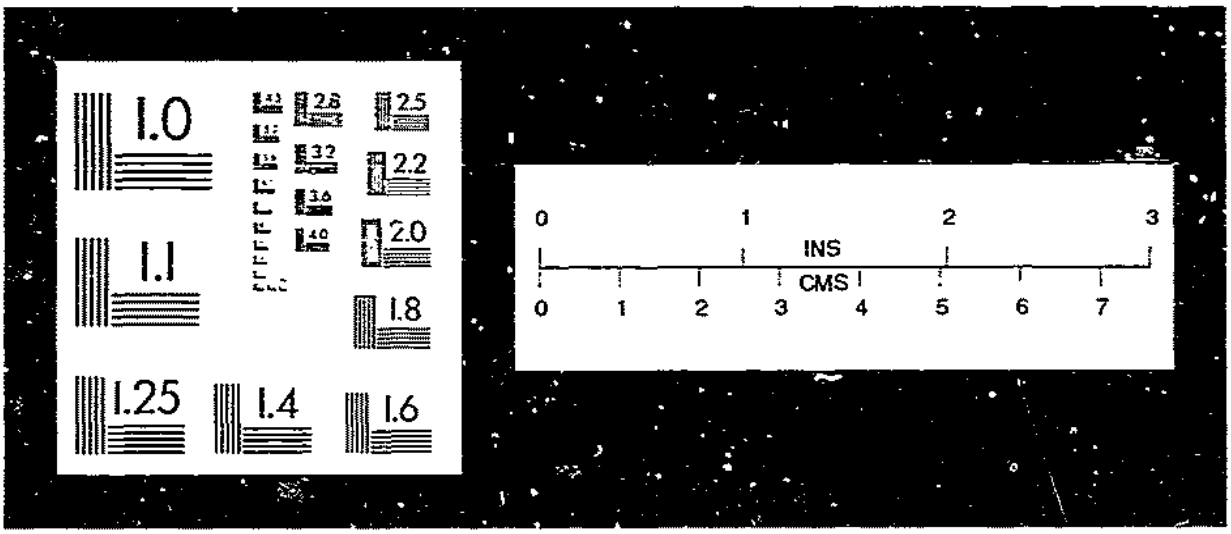

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evolutionary program: (a) immediate development of equipment to detect satellites up to 3,000 miles with orbital inclinations greater than 32°; (b) then development of sensors to detect satellites in all orbital inclinations up to 500,000 nautical miles; (c) continuous studies to enhance data acquisition techniques; and (d) assignment of operational responsibility for NSSCC to NORAD before September 1960.[2]

(S) Although the latter recommendation had been previously discussed within JCS, no action was taken due to service differences over the question of assignment of responsibilities. The Navy, for example, argued that Spacetrack and Spasur were two independent systems, whereas the Air Force took the position that both really were one system with each service supporting its portion. The Air Force also believed that it should be assigned responsibility for integrating the two parts into an efficient system and that NORAD should have operational control.[3]

(S) In August 1960 an ad hoc committee of the Scientific Advisory Board, which included Dr. Eugene Rabinowitz of BBRAB, endorsed the Air Force position. Following a visit to the Hanscom facility and several briefings, the committee had recommended that NORAD be given responsibility for the entire national space surveillance system and that the existing NSSCC be assigned responsibility for new sensor development, and processing, and dissemination of surveillance data. The committee had also called for immediate establishment of a radar sensor development program which would include optical sensors capable of operating at ranges 3,000 to 5,000 miles and above. It further proposed the placement of sensors as near as possible

to the equator within the southern United States and the conduct of studies to determine which sensors could be tied into the national space surveillance center.[4]

(S) On 18 August Under Secretary Charyk raised the question of responsibilities with Secretary Gates. Expressing concern over the lack of a decision, Charyk pointed out that ARPA had ended its support of the development program on 1 July assuming that a single agency would already have been assigned the system. With the passage of time, he said, the problem was becoming more complex and difficult to resolve. Charyk restated the Air Force position that integration of sensors of all three services into a single system was the best approach to achieving an initial, effective capability. He said the Air Force was anxious to do the job if given the responsibility.[5]

(S) On the 19th Secretary Gates took a first step to resolve the problem. He informed JCS that he would soon transfer program responsibility for Spacetrack and Spasur from ARPA to the appropriate military departments and that both would become elements in an integrated satellite detection and tracking system. He asked the Joint Chiefs to provide him with a recommendation "as to the appropriate existing command to which operational control of the satellite detecting and tracking system should be assigned," adding that he thought NORAD might be the appropriate agency.[6]

(S) JCS subsequently reexamined the subject but failed to reach agreement and, on 9 September 1960, decided to send split views to Gates. The Joint Chiefs reported that operational command should rest with the Continental Air Defense Command, but there was disagreement over

NORAD exercising operational control. The Army and Navy believed that CONAD should also have operational control and provide NORAD only with pertinent information. They gave national security as their reasons, pointing out that NORAD was an international organization. However, the Air Force and CINCNORAD countered that, under existing terms of reference, assigning operational command to CONAD would automatically give NORAD operational control, since the former was the American component of the latter.[7]

(C) On 15 September these views and those of Gen. Nathan F. Twining, JCS chairman, who supported the Air Force position, were forwarded to Secretary Gates. On 7 October 1960, Secretary Gates approved assignment of the space surveillance control system to CONAD and NORAD in accordance with the Twining/Air Force recommendations.[8]

(S) In a follow-up action on 10 October, Secretary Gates transferred management of Spacetrack and Spasur from ARPA to the Air Force and Navy, respectively. The two services would henceforth fund and develop their separate projects, which became Spadats elements. He further directed the Air Force to prepare a detailed development and funding plan for an improved Spadats system and to coordinate the document with the Army, Navy, NORAD, and other interested agencies. On 18 October ARPA turned over all administrative and technical responsibility for Spacetrack to the Air Force.[9]

Early Implementation Actions

(S) Following dissemination of the Gates decisions, the Air Defense Command asked the Air Staff to designate it as the operational command to discharge USAF responsibilities for the Spadats system. On 28 October,

Headquarters, USAF indicated that it would assign the national space surveillance control center to ADC after it had attained operational status. In the interim, ADC would act as the operational planning agency for those elements of the system for which the Air Force was responsible. And as a first step, Headquarters, USAF directed ADC to compile user requirements from CONAD/NORAD* and prepare a preliminary operational plan for the improved system, coordinating its planning effort with ARDC.[10]

(S) In conjunction with this effort, the Air Force on 10 November asked CINCONAD to obtain operational requirement statements from other services and interested agencies. Following completion of the NORAD requirement document on 2 December, agencies involved in the preparation of a system development plan reviewed it during a meeting at Hanscom Field on 5-6 December. The conferees agreed to accept NORAD's document as a guide in preparing a preliminary development plan.[11]

(S) In mid-January 1961 a NASA/DOD agreement provided additional guidance. Under its provisions, NORAD would establish the central data collection and cataloging center within its combat operations center (COC). All information from Spasur, Midas, the ballistic missile early warning system, and other military surveillance equipment would feed into the NORAD center for processing and analysis, so that it could detect and establish the orbital path of all satellites and space vehicles launched by foreign countries. NORAD would also obtain from NASA updated tracking information on vehicles covered by the space agency's data collection system, located at the Goddard Space Flight Center, Beltsville, Md. NORAD in turn would provide NASA with timely data as requested.[12]

*ADC was the Air Force component of CONAD.

(S) In February the USAF Chief of Staff issued a directive transferring Air Force space surveillance functions to the Air Defense Command. General White directed ADC to assume full technical administration of the NSSCC, to be established at Ent by 1 July 1961. The interim Hanscom center would revert to its original purpose as an ARDC experimental space detection and tracking facility. On 10 February the Air Staff directed ADC to organize the 1st Aerospace Surveillance and Control Squadron to operate the NSSCC and the Air Force portion of the Spadats system. ADC activated the squadron on 14 February, the first USAF organization assigned a specific military space mission.[13]

(S) In the weeks that followed NORAD issued several integration plans which listed a three-phased program for achieving an operational Spadats system. In the first phase to begin in late February, NORAD would assume operational control of the system and assign a representative to the NSSCC at Hanscom Field. The second phase would involve moving the center to Ent AFB and its integration into the NORAD CCC by 1 July. The third and overlapping phase would cover Spadats research and development to meet future military requirements. On 7 March 1961, in support of Phase II, the Air Force authorized ADC to convert a building at Ent--located adjacent to the NORAD CCC--into the NSSCC.[14]

Spadats Requirements

(U) In mid-March 1961 DDR&E supplied JCS with additional guidance for operating the space detection and tracking system. He specifically noted that NORAD/CONAD should not limit their operations to the Spadats and Spasur

elements alone. Rather they could plan for and request operational control over any military sensor deemed essential to the surveillance mission.[15]

(S) In the meantime, NORAD had asked all interested agencies for comments on and proposed changes to the Spadats requirement document of 2 December. By the end of March all replies were in and, on 7 April, NORAD issued a final report, which it submitted to JCS on 20 April.[16]

(S) The report covered not only user requirements but also the Soviet threat, the purpose and scope of the surveillance system, the operational concept, and related factors. NORAD recognized that the existing system was limited in its capabilities and that an improved sensor program was essential to detect and track all hostile objects in space in sufficient time to permit interception or neutralization as necessary. On a qualitative basis, NORAD said the improved system should be able to detect all spatial objects to 10,000 in number at altitudes ranging from 75 to 20,000 nautical miles.[17]

(S) During May and June 1961 the Joint Staff reviewed the Spadats requirements and concluded that they included the needs of the services, the unified and specified commands, and other agencies. On 16 June, after agreeing to some minor revisions, JCS approved the document and forwarded it to the Secretary of Defense. At the end of the period, however, after his review, Dr. Brown submitted a number of questions to JCS to clarify certain points which would affect the final system configuration.[18]

(C) Meanwhile, the Air Force completed its work on a development and funding plan calling for development of improved sensors based on the electronic scan array radar (ESAR) principle. Earlier, in April and May, this proposed Air Force sensor development program and other aspects of an improved

Spadats system had been studied by another ad hoc committee of the Scientific Advisory Board, convened at the request of Maj. Gen. R.M. Montgomery, Assistant Vice Chief of Staff. The committee completed its report in June and recommended implementation of the development plan. The committee declared that the space environment by 1965-1975 would be sufficiently dense (with up to 10,000 objects) and complicated to warrant immediate development of the proposed radar system.[19]

(C) At the close of the period, while the Air Force awaited OSD's reaction to the development plan, ADC assumed technical control of the space detection and tracking system. Actual operations of the new national space surveillance control center began at Ent AFB on 12 June 1961. Following installation and testing of the center facilities, ADC officially accepted the Spacetrack system from AFSC on 1 July and assumed responsibility for technical operation of the Spadats system for CINCNORAD.

IX. COMMUNICATION SATELLITE PROGRAMS

(S) One of the most useful applications of space technology which the Air Force pursued was in the area of satellite communications. More than a decade before Sputnik I, the Rand Corporation proposed (in February 1947) a space-based communication system. However, it was not until the summer of 1958 that ARPA authorized USAF to prepare an abbreviated development plan outlining a program to achieve a satellite communication system. On 19 December 1958, while this plan was being prepared, the potentialities of a space-borne system were demonstrated for the first time with Project Score—the orbiting of an Army-developed communication package carried into space by an Atlas vehicle. On that date the recorded voice of President Eisenhower was broadcast to the world from outer space.[1]

(S) The success of Project Score stimulated a number of communication proposals by the services. The Army proposed and ARPA authorized development of a delayed repeater communication satellite system designated Project Courier.* In March 1959 the Air Force submitted its proposal to develop a polar orbiting satellite for use primarily in controlling the SAC airborne fleet. ARPA approved the USAF proposal, but embodied it in a three-phased communication satellite program, which included: Steer, the SAC command and

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*Similar to the Score experiment, Project Courier called for orbiting a satellite with a capability to receive and store messages on a tape recorder. As the satellite passed over one station to another, on command the messages could be transmitted.

control satellite operating on UHF frequencies; Tackle, an advanced polar satellite designed for microwave frequencies; and Decree, a 24-hour synchronous satellite. General program supervision, with certain exceptions, was assigned to ARDC.[2]

(S) While initial development work was proceeding, OSD initiated a series of cost studies of the three-phased program which by the end of the year led to a major reorientation. In February 1960 ARPA formally announced that OSD would concentrate its development effort on the 24-hour synchronous system, designated Project Advent, and would discontinue the others. It also directed the Army to phase out Courier after completing two scheduled flights.* [3]

Project Advent

(U) The reoriented communication satellite project called for placing a vehicle into a circular orbit in the equatorial plane at an altitude of 22,300 miles. In such an orbit the angular speed of the satellite would be synchronized with the rotation of the earth and would appear to be stationary, hovering over a specific point. To develop the operational system, ARPA divided responsibilities among the three services: the Army would develop equipment for both the satellite and ground stations; the Air Force would develop the satellite vehicle (exclusive of communication equipment), launch the satellite, and inject it into proper orbit; and the Navy would develop

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*The Air Force launched the two Courier satellites on 18 August and 4 October 1960 using Thor Able rockets. Only the second launch was successful; Courier I-B entered a 500-mile orbit and successfully received and transmitted written and voice messages.

and operate a shipborne terminal. Total cost of the system was estimated at $174 million.[4]

(C) Unfortunately, by dividing the program three ways, ARPA laid the basis for new interservice squabbling, mostly between the Army and Air Force. This occurred despite the fact that ARPA finally assigned overall project management to the Army. This action occurred on 15 September 1960. In transferring responsibility, J.H. Douglas, Acting Secretary of Defense, specified, however, that the Air Force would continue to exercise development responsibility and contracting authority for the final stage vehicle and the booster, and it would also be responsible for tracking, telemetry, and launchings.[5]

(C) The Air Force was unhappy with this management arrangement and with the fact that its requirements would not be fulfilled by Advent, since SAC aircraft employed UHF and Advent would use microwave frequencies. Seeking to achieve its objective, the Air Force directed AFBMD to prepare two abbreviated development plans for a strategic communication satellite system. Submitted in early September, these plans called for the launching of four UHF-equipped satellites in a 24-hour circular orbit inclined to the equatorial plane, which would provide continuous coverage over North America to the North Pole. AFBMD estimated either development proposal, if implemented, could produce an operational system by early 1964. The cost estimate ranged from $181 to $240 million, depending on the type of upper stage booster used.[6]

(C) The Air Staff and SAC strongly endorsed these proposals and in the fall of 1960 a series of internal headquarters actions were begun aimed

at obtaining Secretary of the Air Force approval. These activities, however, proved fruitless as OSD remained firmly committed to the Advent project and refused to authorize any funds for the USAF proposal. The Air Force, meanwhile, became a target for some criticism that it was "intruding upon the space domain of the Army and the civilian space agency" by actively pursuing new communication satellite projects. Whereupon, the Air Staff drew back and, on 22 December, General Wilson, DCS/Development cautioned General Schriever that continuation "of any programs specifically assigned to other services by the Secretary of Defense can only lead to criticism of our R&D effort." He asked that all such efforts be cancelled. General Schriever subsequently took steps to insure ARDC's complete cooperation with the Army in carrying out Advent program objectives.[7]

Management and Technical Problems

(U) Despite this effort at cooperation, by early 1961 Advent management had become unsatisfactory. The difficulties centered on areas of responsibility assigned to the Army and Air Force and differences on methods of contractual negotiation and supervision and on certain technical matters. The Army had created a special Advent management agency at Fort Monmouth to assume overall technical and financial management responsibility for the project. This agency apparently found itself "thwarted" by the Air Force's role, while the Air Force made similar charges against the Fort Monmouth group.

(C) To resolve these difficulties, in March 1961 DDR&E prepared a report on Advent project management for Secretary McNamara, who then asked for Army and Air Force comments. The report listed four possible ways to streamline

project management, one of which involved transferring the space vehicle contract from the Air Force to the Army, another which would give the Air Force responsibility for the entire program, except for the communication payload and ground communication equipment. DDR&E favored the first proposal.[8]

(C) After the Air Staff had reviewed the document, Under Secretary Charyk reported to OSD on 20 April 1961 that the Air Force agreed changes in the Advent management structure were desirable but disagreed with the proposal to transfer the space vehicle contract. He said such an action would only create new problems and would upset the close working relationships required for spacecraft development, booster modification, and launch complex and tracking and acquisition activities. On the other hand, the Air Force supported the proposal to transfer primary responsibility to the Air Force. Such action, Charyk said, would greatly enhance the program since the Air Force could do the management job without creating a new agency such as the Army's Monmouth group, which had ballooned to over 130 personnel.[9]

(C) As it turned out, OSD decided to make no immediate changes in the existing management arrangement pending further studies.* However, on 29 May Secretary McNamara informed the services that "we must get on" with the job of resolving the managerial and technical problems affecting Advent. He reaffirmed that Advent was "the only approved active communication satellite

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*A complicating factor was President Kennedy's decision to seek creation of a global commercial communication satellite system with participation of other nations.

project" in DOD; although it was assigned to the Army, it was "not an Army project" but rather an undertaking "to support all DOD elements." [10]

(U) The problem referred to by McNamara involved the Advent booster as well as space vehicle and payload development. The original Advent development plan called for a satellite weighing 1,000 pounds to be launched into a 22,000-mile orbit using an Atlas-Centaur booster combination. However, as work proceeded, the contractor found the satellite's weight had risen by several hundred pounds which put it beyond the capability of Centaur to orbit at the proper altitude. Seeking a solution to this critical problem, the Air Force and NASA (which was responsible for Centaur development) undertook studies of ways to increase the booster performance, as well as possible alternatives. On 20 June Dr. Brown advised the Air Force and Army to "allow" Centaur and Advent development efforts to go forward undisturbed, pending completion of studies which could provide "a long range solution which will impose minimum burdens on current project efforts." [11]

Passive Communication Satellites

(C) On 12 August 1960 NASA's Echo I satellite, a 100-foot diameter aluminized mylar plastic balloon, was successfully launched into orbit by a USAF Thor-Delta rocket and was immediately put into service as a passive communication reflector. For example, between 12 and 30 August the Air Force used the sphere to send both voice and teletype messages between Rome Air Development Command test sites at Floyd, N.Y., and Trinidad, British West Indies. NASA also used the satellite to bounce President Eisenhower's voice and other messages between Goldstone, Calif., and Holmdel, N.J. [12]

(C) Following these successful tests, the Air Force initiated studies of a possible launch program using new spheres, which could enable it to pursue separate experiments in passive satellite communication techniques. However, it first had to overcome a roadblock in the form of a 1958 DOD/NASA agreement which assigned passive communication satellite research to the space agency and active satellite systems to the Defense Department. In September and October 1960 the Air Force sought to have this agreement modified so that it could begin a passive communication research program.[13]

(C) The Air Force proposal was discussed on 27 October during a meeting of the Unmanned Spacecraft Panel of the Aeronautics and Astronautics Coordination Board. At a second meeting in early November, Air Force and NASA officials agreed on a joint plan for future launchings of rigid and non-rigid spheres for passive communication experiments.* Whereupon, the Air Force proceeded with plans for passive communication research program and let a contract for design and construction of a test terminal at Eglin AFB, Fla.[14]

(C) Several weeks later, however, when these activities came to the attention of John Rubel, Deputy DDR&E, he complained that the Air Force had undertaken the research program without explicit authority from OSD. He asked for a resume of research, contracts, responsible agency, and other aspects of the new program. On 21 December 1960 USAF representatives briefed Rubel and other OSD officials, and they asked for more information.

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*NASA's cooperation in the passive field was tied in with its desire to undertake certain active satellite communication projects, which it initiated during fiscal year 1961.

The additional data failed to satisfy Rubel, and he directed the Air Force to cancel its planned installation at Eglin. Several months later, however, after a further review, Rubel withdrew his directive and allowed the Air Force to carry out experiments to determine whether communications between a large fixed ground station and a mobile station via a passive satellite were feasible. He also authorized the Air Force to relocate certain portions of the proposed Eglin facility to Rome, N.Y.[15]

(C) At the close of fiscal year, in response to another request from DDR&E, the Air Force undertook an in-house feasibility study to determine and outline the technical possibilities of using either passive or active satellites to provide DOD with an early space communication capability, without going through a long development program.[16]

Project West Ford

(S) In still another approach to the problem of insuring survivable communications, the Air Force during the year initiated Project West Ford (originally designated Project Needles), which would involve the launching into orbit of a package containing about one billion tiny metal filaments. Ejected at an altitude of 2,000 miles to form an orbital belt about 30 miles in diameter, with a separation of 50 to 100 feet between them, the filaments were expected to reflect communication signals in the 3-centimeter range. The Air Force planned to fly the package piggyback aboard a Midas test vehicle.[17]

(S) On 4 August 1960 DDR&E approved West Ford plans, but in authorizing the program, Dr. York stipulated that no operational belts would be placed in

orbit until results of the first experiment had been thoroughly evaluated. On 17 August the National Security Council's Operations Coordinating Board (OCB) also approved the undertaking, but several days later CINCNORAD protested to JCS. General Kuter said that he feared the dipoles might have a major unfavorable impact on air defense electronic equipment. He cited possible collisions between Midas satellites and the orbiting particles and questioned the wisdom of suggesting to the Russians a means by which they might inhibit the effectiveness of NORAD detection and tracking systems. Other important criticism came from European scientists led by Sir Bernard Lovell of Great Britain, who protested that the project would endanger both optical and radio astronomical research.[18]

(S) On the basis of these protests, during the latter months of 1960 the originators of the project, Lincoln Laboratories, initiated a thorough review and concluded that there would be little adverse effects. On 12 December JCS assured General Kuter that there was little likelihood of the dipoles interfering with either vehicles or communications. JCS thought that the project should proceed since the technique offered significant advantages in terms of invulnerability to jamming, elimination of complex electronic equipment, and great flexibility with respect to antennas and bandwidths.[19]

(S) Doubts about the project remained, however, and in early 1961 a new question was posed concerning the life span of the filaments, which might be longer than predicted. This possibility caused still another review and plans for an early launching were cancelled. Not until the summer of 1961, after a

thorough re-evaluation and National Security Council concurrence, did President Kennedy give the "go-ahead" to conduct the first experiment.

X. OTHER SPACE UNDERTAKINGS

(U) The Air Force during 1960-1961 played a direct planning, development,or supporting role in a half-dozen other military and civilian space projects. These included USAF's Aerospace Plane, the AEC-supported Snapshot, Navy's Transit, the tri-service Anna geodetic satellite, ARPA's Vela Hotel, and NASA's Mercury.

Aerospace Plane

(U) Among the advanced concepts submitted to the Air Force as a possible means of leap-frogging the Soviet Union in space, none stimulated the imagination more than a proposal to develop an aerospace plane. The concept called for a manned vehicle that would take off from the ground like a conventional aircraft, fly directly into an earth orbit, de-orbit at will, and land at a conventional airfield. Such a vehicle, if it could be developed, would permit the Air Force to carry out manned space operations in a smooth and natural extension of existing air operations.

(S) The space plane concept was born during USAF-sponsored studies of recoverable, airbreathing boosters conducted in 1958-1960 by Convair and Lockheed. Their studies pointed to the possibility of building a horizontal takeoff and landing winged recoverable vehicle capable of flying into low altitude orbits and returning. According to their proposed concept, the vehicle would take off in a conventional mode carrying equipment capable of

converting air to liquid oxygen during flight. At the top of its climb, at a speed of Mach 8, the vehicle would transition to rocket mode and, using the liquid oxygen to feed six hyperjet engines, would inject itself into orbit.[1]

(S) The exciting potential of such a vehicle led the Air Force to issue an advanced development objective (ADO 21) in August 1960, covering a single stage, orbital manned aerospace plane. The purpose of the ADO was to serve as a guide for future studies and applied research leading to a system capable of operating from subsonic to orbital flight. Military capabilities visualized included aerospace offense and defense, reconnaissance, surveillance, and logistic.[2]

(S) From the beginning of space plane research, USAF officials recognized that the key to success would be propulsion. Because it was impractical to carry huge quantities of fuel aloft, the proposal to give the aerospace plane a capability to collect and store liquid oxygen for its engines during atmospheric flight seemed a possible breakthrough. This airborne manufacturing process was to be carried out by a special component called a liquid air cycle engine (LACE). That such a system was feasible was demonstrated in September 1960 by experiments conducted by Wright-Patterson AFB propulsion engineers.[3]

(S) Beginning in October the Directorate of Operational Requirements briefed key Air Staff officials on the concept and the technological problems involved. In summary, the directorate noted that the challenge of such a vehicle was very great and would require more significant technological

advances in more areas than in any other program undertaken by the Air Force. The directorate estimated a vigorous applied 18-month research effort--to enable the Air Staff to realistically assess development possibilities--would cost $33 million during fiscal year 1961 and $56.7 million in fiscal year 1962. The directorate proposed a dual contractor effort to lead to a mockup and source selection by late 1965 and a flight test as early as mid-1968.[4]

(S) The Air Staff, impressed by the military potentialities inherent in the aerospace plane, agreed to pursue an early feasibility demonstration program. The Air Force Council and General White endorsed this approach in October 1960 and authorized internal Air Force reprogramming action to provide initial funding. The Chief of Staff also approved submission of a request to OSD for emergency funds to support fiscal year 1961 work. Subsequently, Assistant Secretary Perkins asked the Scientific Advisory Board to review the concept. After a two-day examination with industry and USAF personnel, SAB's ad hoc committee reported that the proposed designs for the plane appeared "to violate no physical principles," but their feasibility depended on "a combination of optimistic assumptions for the performance of components and subsystems." The committee concluded, however, that the applied research program should be supported and strengthened.[5]

(S) On the basis of the SAB committee report, Perkins in January 1961 approved the applied research program and the Air Force reprogrammed $6.25 million. It also submitted a request for funds in the revised Kennedy FY 1962 budget. However, in early March 1961 the Secretary of Defense disapproved the latter request and also refused to provide any emergency 1961 funds.

Subsequently, the SAB recommended separating the aerospace plane effort into discrete technical projects rather than one integrated system until further progress had been achieved.[6]

(S) In the meantime, the Air Staff submitted a study requirement to Dr. Charyk proposing to spend $1 million in fiscal year 1961 to pursue concepts that might enable it to achieve a single stage-to-orbit capability. The Air Staff said the conclusions of such a study were needed to guide future applied research programs, particularly in the area of propulsion, aerodynamics, and materials. On 10 May Charyk approved the study requirement and forwarded it to the Secretary of Defense. At the end of the period, the Air Force still awaited action by OSD.[7]

Snapshot

(S) During the year the Air Force supported a program to use nuclear auxiliary power sources in satellites and space vehicles. USAF had established a requirement for such units as early as 1955, when it became apparent that new power sources would be needed for future reconnaissance satellites. The responsibility fell upon the Atomic Energy Commission (AEC), which undertook to develop what it designated as Systems for Nuclear Auxiliary Power (Snap). This program, pursued during 1957-1960, led to development of the Snap 1 radioisotope unit, which generated 250 kilowatts of electricity for a period of 230 days, and Snap 2, a reactor-type unit which generated 3 kilowatts for one year. AEC eventually moved on to the development of Snap 10, which would generate 300 watts of power.[8]

(S) In the spring of 1960, at OSAF's request, ARDC prepared a development plan for ground and flight testing two of the AEC devices. It proposed an orbital test program designated Snapshot involving four launchings from the Atlantic Missile Range, the first scheduled for September 1962. The purpose was to place the units into 600-700 mile circular orbits, then activate the reactors, eliminating ground hazards should the rockets explode and disperse the radioactive materials during the boost phase.[9]

(S) In seeking OSD's approval for the Snapshot tests, Assistant Secretary Perkins on 2 November 1960 informed Dr. York that actual orbital flight was the only way to demonstrate the technical feasibility of such auxiliary power units. He urged York's approval, pointing out that the Snap units, being rugged and capable of operating continuously at peak power, offered unique advantages for meeting Samos and Midas operational needs. York subsequently agreed to proceed with the program and authorized the Air Force to spend $750,000 during fiscal year 1961. He also approved USAF's funding proposal of $8.5 and $12 million for fiscal years 1962 and 1963 respectively.[10]

(S) On 27 December, in a follow-up action, OSD formally requested AEC's cooperation and participation in the Snapshot orbital test program. The commission promised its cooperation, undertook to secure White House approval for the first use of a nuclear reactor in space, and to develop ground test, transport, and flight test reactor power generators for the program. In March 1961 AEC reported to OSD that it could provide an improved Snap 10A unit (producing 500 watts of power) as a substitute for Snap 10, with first

deliveries in January and March 1963, and Snap 2 units by January and March 1964.[11]

(S) In April the Space Systems Division published a proposed advanced technology program plan which documented the changeover to Snap 10A units and rescheduled the flights to March and June 1963. The program budget also was revised upward to a total of $42 million through fiscal year 1965. Following receipt of this plan, Headquarters, USAF issued an advanced development objective (ADO 28) which formally established Snapshot as part of the advanced development program.[12]

(C) Meanwhile, under the accelerated U.S. space program wrought by the Gagarin flight, OSD initiated a special review of Snapshot to explore the possibilities of flight testing a Snap unit aboard a forthcoming Transit satellite (see below). Barring objections from the White House or NASA, the Atomic Energy Commission agreed to supply a unit. These actions would, in effect, establish a national policy decision on the use of nuclear devices in space. The White House concurred in the proposal and on 29 June 1961 the nuclear unit was successfully launched into orbit aboard Transit IV-A. There was no noticeable public or international outcry.[13]

(S) Earlier, after AEC and AFSC had reached agreement on the proposed program plan, the Space Systems Division in late May 1961 issued a letter contract to Lockheed covering adaption of the Agena vehicle to Snapshot use. On 28 June the Air Force published a development directive (AT-1) which defined the Snapshot test program as aimed at demonstrating that nuclear reactor power sources could be launched safely and operated in space over extensive periods of time.[14]

Transit

(U) During fiscal year 1961 the Air Force successfully orbited two Navy Transit navigation satellites, using Thor-Able-Star boosters. Three other satellites in this Navy-managed program were previously launched by the Air Force, the first on 19 September 1959.

(C) In the current period the Air Force launched Transit III-A from Cape Canaveral on 30 November 1960 but a booster malfunction resulted in a failure to orbit. The next launching, on 21 February 1961, was successful; Transit III-B and a piggyback satellite designed to measure very low frequency signal intensities were orbited, although the two vehicles failed to separate. The most significant launch of the period took place on 29 June when the Air Force successfully orbited Transit IV-A and two piggyback satellites. It was this Transit vehicle which was equipped for the first time with a Snap radioisotope battery. The two piggyback satellites were a 55-pound galactic radiation experiment background (GREB) unit designed to measure solar radiation and a 40-pound Injun satellite to gather data on auroral phenomena and the earth's radiation belts.[15]

Anna

(S) The Air Force was an active participant in Project Anna, a tri-service geodetic satellite to collect data on the exact location of various points on the surface of the earth. Originally begun as a NASA-sponsored project in 1959, the geodetic satellite aroused the interest of the services because of its implications for military targeting. In August 1960 representatives of the services met and agreed to pursue development of a joint

geodetic satellite system and to classify all data obtained.[16]

(S) Officials of the space agency, although reluctant to classify information deemed of interest to scientists around the world, were persuaded that the needs of DOD were overriding. In September DOD's priority was confirmed by the Unmanned Spacecraft Panel of the Aeronautics and Astronautics Coordinating Board. In accepting the requirement to classify "precision geodetic data," the panel agreed that DOD should proceed with development of a geodetic satellite in coordination with NASA. The panel specified, however, that NASA scientists would be supplied classified data for use in research on the structure, shape, and gravitational field of the earth. The full board endorsed this agreement.[17]

(C) On 26 September DDR&E asked the three services to propose the appropriate techniques to employ with Anna. In early October the Air Force submitted its proposal for an optical technique which would provide geodetic data through observations of a flashing light contained in the satellite. The Army recommended a radio ranging method using an apparatus designated Secor (sequential collation of range), while the Navy proposed a radio doppler technique similar to that used in the Transit system. In submitting its proposal, the Air Force expressed a willingness to support an experiment to determine which of the three techniques was most suitable.[18] Subsequently, the departmental assistant secretaries for research and development jointly recommended their approval of the project.

(C) On 9 December 1960 Dr. York authorized the work and $5.4 million for booster and satellite vehicle development. He assigned project management

to the Bureau of Naval Weapons and made each service responsible for furnishing and operating its own satellite instrumentation and for receiving and reducing its own data. The Navy later assigned project technical direction and integration of the satellite package to the Applied Physics Laboratory of the John Hopkins University.[19]

(C) In January 1961 USAF assigned responsibility for developing its portion of the satellite (a flashing stroboscopic light device) to the Air Force Cambridge Research Laboratories. In the months that followed several administrative problems arose complicating Air Force participation, but at the close of the period these had been resolved and work was proceeding on the instruments.[20]

Vela Hotel

(U) Vela Hotel was an ARPA-sponsored project which sought to demonstrate the capability of a satellite to detect "secret" nuclear tests in outer space. It was an outgrowth of American-Soviet disarmament negotiations being conducted at Geneva, Switzerland. ARPA formally established Vela Hotel on 8 December 1960 as a two-phase program: the first called for orbiting detection instruments aboard Discoverer satellites to obtain "low altitude" data below the Van Allen belt, and the second with a "high altitude" detection system. ASDC was given the assignment of initiating a limited-scope research and development program.[21]

(C) In January 1961 ARPA provided additional guidance concerning program management and technical responsibilities. The agency assigned the task of preparing a development plan to a joint planning team composed of DOD, AEC,

and NASA representatives, headed by an ARDC official, and it created a joint group, also headed by an ARDC official, to supervise the technical work.[22]

(C) Early in March the Secretary of Defense authorized the Air Force to proceed with the piggyback Discoverer flights. On 1 April ARPA and Air Force Systems Command (ARDC's successor) approved the joint planning team's development plan, dated 9 March. In the high altitude detection phase, instrumented satellites would be placed into orbits with a perigee of 200 miles and an apogee of 50,000 miles. However, a special presidential panel on high altitude detection, headed by Dr. W.K.H. Panofsky of Stanford University, concluded that these satellites would not meet tentative Geneva treaty requirements. Specifically, the group recommended the use of the Atlas-Agena combination to place two detection satellites into a 50,000 mile circular orbit.[23]

(C) In June ARPA directed the Air Force to revise the 9 March development plan to reflect the Panofsky panel recommendations and authorize AFSC to select, on a competitive basis, the spacecraft contractor. In addition, it released funds to proceed with the first four low-altitude Discoverer-instrumented flights.[24]

Mercury

(U) During the year the Air Force played an important supporting role in the NASA Mercury manned orbital flight program. Under terms of a March 1960 DOD-NASA agreement, the Air Force was assigned responsibility for supplying and launching the Mercury Atlas vehicles. In addition, it would

provide a wide range of mission support, including air rescue aircraft for capsule search and recovery operations, mapmaking services of the Aeronautical Chart and Information Center, several C-54's for network station checkout, astronaut normal flight and zero-G training, launch and control center facilities at Cape Canaveral, and communications. USAF's Aerospace Medical Center also assisted in astronaut training and supplied animal test packages for use during the test flight program.[25]

(U) The Air Force launched three Mercury Atlas test vehicles during the period—on 29 July 1960, and 21 February and 25 April 1961. It also provided general support for the Mercury Redstone suborbital flight of Cmdr. Alan B. Shepard on 5 May 1961, and supplied the 37-pound chimpanzee, Ham, who preceded Shepard in a suborbital flight on 31 January 1961. In addition to these activities, USAF's Sacramento Peak Observatory in March 1961 began making daily five-day predictions of solar flare activity which might affect either manned or unmanned Mercury operations.[26] The Air Force estimated that support of Mercury during fiscal year 1961 totalled more than $25.2 million, of which it received reimbursement from NASA of some $23 million. At the end of the period 60 USAF personnel also were serving on active duty with the space agency.*

*During fiscal year 1961 the Air Force also supported several other NASA space projects, including the Tiros weather satellite program and a lunar probe project. On 23 November 1960 USAF successfully launched Tiros II with a Thor-Delta booster combination. Two lunar proces on 25 September and 15 December 1960, using Atlas-Able rockets, were, however, unsuccessful.

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G L O S S A R Y

AACB	Astronautics and Aeronautics Coordinating Board
ADC	Air Defense Command
ADO	Advanced Development Objective
AEC	Atomic Energy Commission
AFBMC	Air Force Ballistic Missile Committee
AFBMD	Air Force Ballistic Missile Division
AFBM&SC	Air Force Ballistic Missile and Space Committee
AFOS	Air Force Objective Series
AFSC	Air Force Systems Command
AFSSD	Air Force Space Systems Division
AMC	Air Materiel Command
Anna	Army, Navy, Air Force (Geodetic Satellite Project)
App	Appendix
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
Bambi	Ballistic Missile Boost Intercept
BM	Ballistic Missile
CIA	Central Intelligence Agency
Cmte	Committee
COC	Combat Operations Center
COMINT	Communications Intelligence
CONAD	Continental Air Defense Command
DDR&E	Directorate of Defense Research and Engineering
Dev	Development
DOD	Department of Defense
ELINT	Electronic Intelligence
ESAR	Electronic Scan Array Radar
GREB	Galactic Radiation Experiment Background
HETS	Hyper-Environmental Test System
IOC	Initial Operational Capability
JCS	Joint Chiefs of Staff
Jt	Joint
LACE	Liquid Air Cycle Engine

G L O S S A R Y (Cont'd)

Midas	Missile Defense Alarm System
Min	Minutes
NASA	National Aeronautics and Space Administration
Natl	National
NORAD	North American Air Defense Command
NSC	National Security Council
NSSCC	National Space Surveillance Control Center
OAR	Office of Aerospace Research
OCB	Operations Coordinating Board
OSD	Office of the Secretary of Defense
Prelim	Preliminary
Prog	Progress
RCA	Radio Corporation of America
RDO	Required Operational Capability
RBS	Random Barrage System
Recon	Reconnaissance
SAC	Strategic Air Command
SAF	Secretary of the Air Force
Saint	Satellite Inspector
Sat	Satellite
SCWS	Space Counter Weapons System
Secy	Secretary
Snap	System for Nuclear Auxiliary Power
Spad	Space Patrol Active Defense
Spadats	Space Detection and Tracking System
Spasur	Space Surveillance
Stmt	Statement
Subcmte	Subcommittee
Sys	Systems
USIB	United States Intelligence Board
VP	Vice President
Wkg	Working